3 Process Metering Pumps

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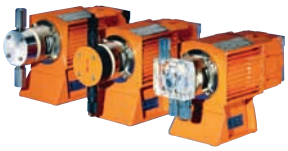
Accessories:

Accessories on request. See chapt. 2 Accessories

3.0 Overview Process Metering Pumps

3.0.1 Product Overview



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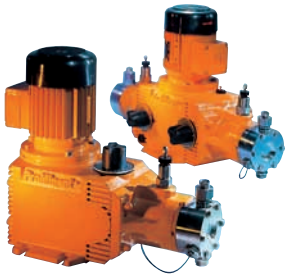
Diaphragm Metering Pump EXtronic®

The metering of liquid media in explosive areas makes extremely high demands on the components used.

The metering pumps of the series ProMinent EXtronic®, Zone 1, Group II, as well as in the version EXBa S for firedamp-endangered mining operations are optimally designed for use in explosive operating sites.

Capacity range: 0.23 - 60 l/h; 25 - 1.5 bar



pk_2_132

Hydraulic Diaphragm Metering Pumps Hydro

The optimal solution in the lower capacity range up to 100 bar. The two series Hydro/ 2 and 3 can be flexibly combined as single-end, double end or multiplex station. In the standard version with multilayer safety diaphragm and integrated overflow valve, the pump meets the highest safety requirements.

Standard material combinations

- PVT (PVDF liquid end/PFTE multilayer diaphragm)
- SST (SS liquid end/PFTE multilayer diaphragm)
- HCT (Hastelloy liquid end/PFTE multilayer diaphragm)
- Capacity range Hydro/ 2: 3 - 72 l/h; 100 - 25 bar
- Capacity range Hydro/ 3: 10 - 180 l/h; 100 - 25 bar

pk_2_133

Diaphragm, Hydraulic Diaphragm, Plunger Metering Pumps Makro TZ

The right modular solution for any application, be it simple, mechanical diaphragm pumps or high-tec hydraulic diaphragm pumps or highly robust plunger pumps. In the pressure range up to 10 bar, a.o. highly chemical-resistant plastics for the liquid end types are standardised, e.g. PP, PVC, PTFE.

- Capacity range TZMb (mech. actuated diaphragm pump): 260 - 2.100 l/h; 12 - 4 bar
- Capacity range TZHb (hydr. actuated diaphragm pump): 300 - 1.200 l/h; 16 - 10 bar
- Capacity range TZKa (plunger metering pump): 8 -1.141 l/h; 320 - 11 bar

pk_2_134

Diaphragm, Hydraulic Diaphragm, Plunger Metering Pumps Makro/ 5

The Makro/ 5 is a powerful metering pump for numerous types of applications, available as mechanically linked diaphragm pump, high-tec hydraulic diaphragm pump and highly robust plunger pump.

The basic version can be upgraded with modules to a double liquid end or multiplexed station.

- Capacity range M5Ma (mech. actuated diaphragm pump): 1.540 -4.000 l/h; 4 bar
- Capacity range M5Ha (hydr. actuated diaphragm pump): 450 - 6.000 l/h; 25 - 6 bar
- Capacity range M5Ka (plunger metering pump): 38 - 6.000 l/h; 320 - 6 bar

pk_2_135

Hydraulic Diaphragm Metering Pump ORLITA® MF

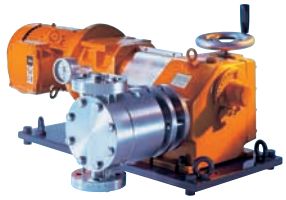
The metering pumps of the MF series are modular in construction and basically comprise drive mechanism, crank and liquid end as separate functional groups. The hydraulic diaphragm liquid end is equipped with a PTFE dual diaphragm system with integrated rupture indicator. An integrated relief valve protects the pump against overload.

The pumps have an extraordinary suction capacity (up to 8 m suction height).

They guarantee trouble-free operation thanks to a pump-internal overflow and diaphragm protection and thanks to a valveless and almost nonwearing anti-cavitation device.

The standard capacity range of the 6 MF series is: 2 l/h - 28 m^3/h at 700 – 9 bar

3.0 Overview Process Metering Pumps



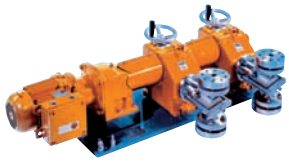
pk_2_136

Hydraulic Diaphragm Metering Pump ORLITA® Mh

Like the MF series, this pump is also extremely flexible in its application, however, designed for highest pressures (up to 3.000 bar). The pump ends are equipped with dual stainless steel diaphragms, designed for maximum operational reliability, are low-wear and can be fitted without special tools.

A relief valve as well as an automatic vent valve for the hydraulic chamber are integrated in the pump end. The valveless forced anti-cavitation of leaked hydraulic fluid is non-wearing and guarantees optimum metering accuracy.

The standard capacity range of the 6 Mh series is: 1 - 773 l/h; pressure up to 900 bar (special version up to 3.000 bar).



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Plunger Metering Pump ORLITA® PS

The PS pump series convinces by a particularly high hydraulic efficiency, excellent self-cleaning, and a low pressure loss. The PS pumps can be used in a wide range of temperatures (up to 400 °C), are easy to maintain, attractively priced and robust.

The plunger packing can also be adjusted in operation using the front clamp screw.

The standard capacity range of the 6 series is: 1 l/h - 37m^3/h; 400 - 8 bar.

pk_2_138

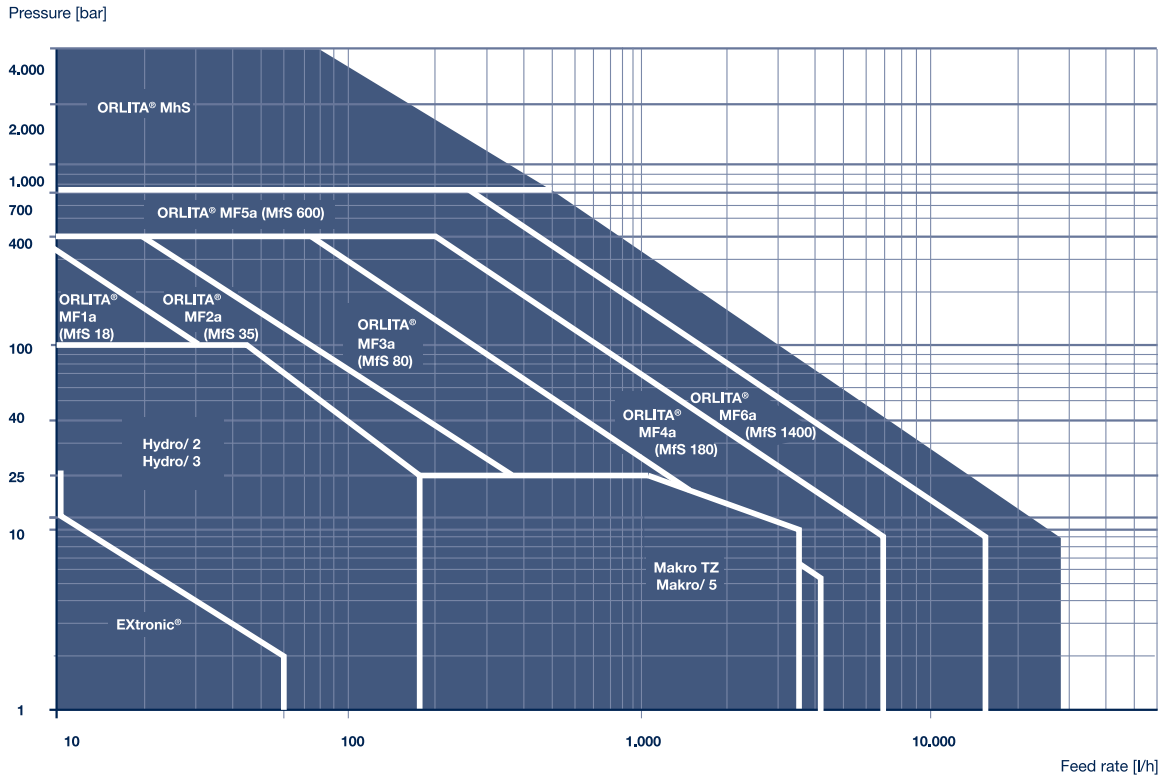
Valveless Plunger Metering Pump ORLITA® DR

Valveless plunger-type metering end. It functions by means of a simultaneous oscillating and rotating plunger action. The displacement body itself opens and closes the suction and pressure side. The pump thus does not need any valves and can be operated in a broad stroke frequency range.

This functional principle facilitates precise metering of high to highly viscous media (up to 1.000.000 mPas). Even liquids with solid fractions can be smoothly metered by the valveless plunger metering pumps. Products with a temperature between -40 °C and +400 °C can be continuously delivered from 0-100 %.

The standard capacity range of the 2 series is: 1 - 4.000 l/h; 400 - 4 bar

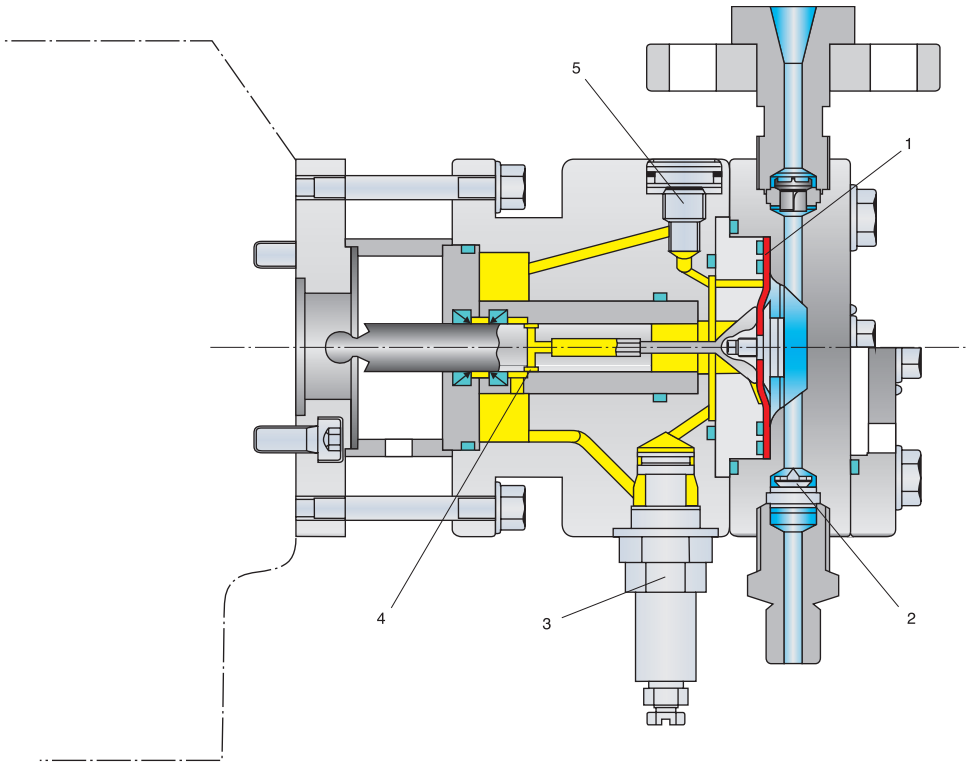
3.0.2 Selection Guide



pk_3_07_diagramm

Detail On ORLITA® MF Delivery Unit

Pump end with hydraulically displaced diaphragm. The dual PTFE diaphragm hermetically seals off the areas in contact with the product from the hydraulic component.



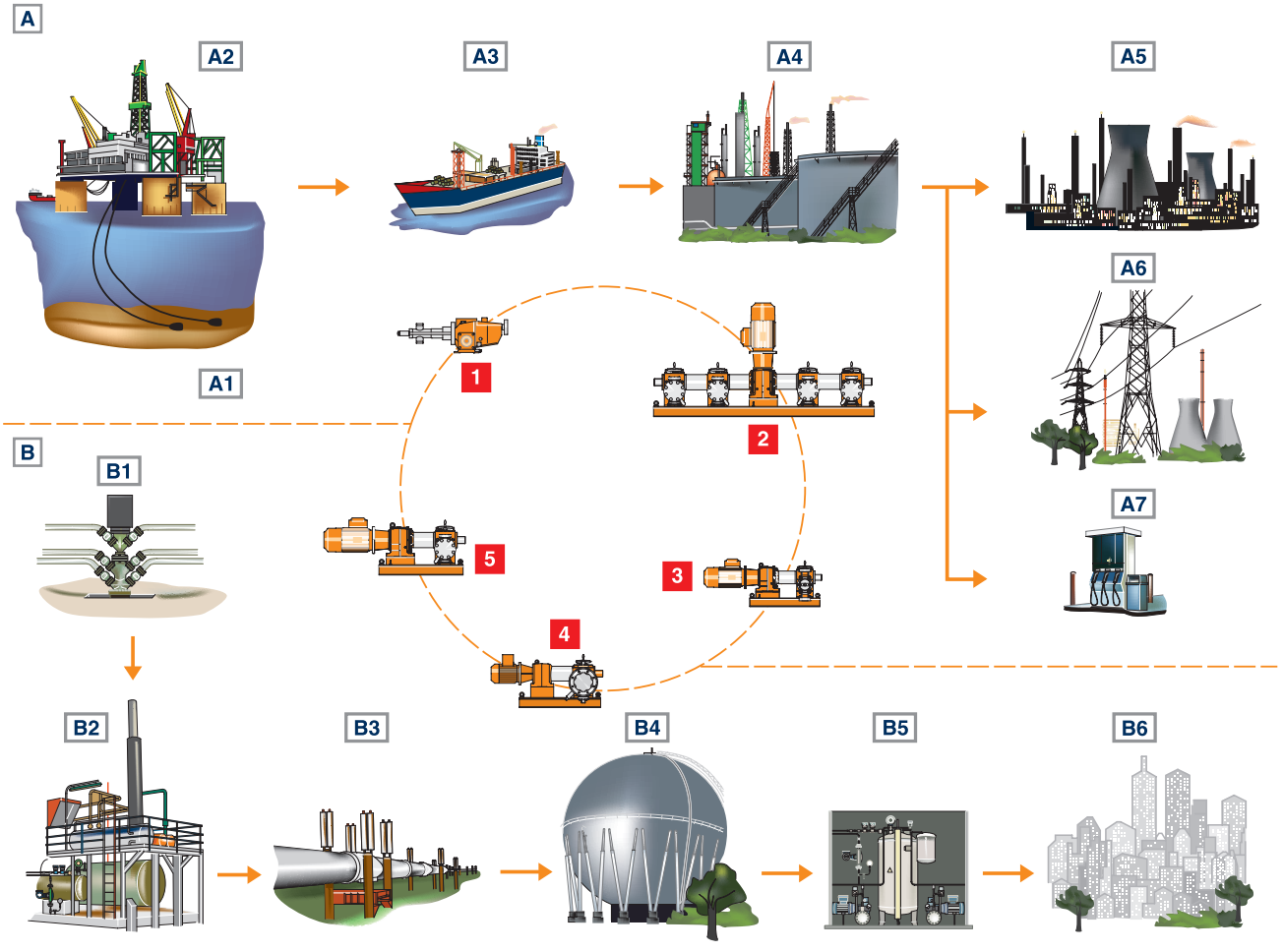
1 PTFE multilayer safety diaphragm
2 Valves with self-cleaning effect
3 Integrated pressure relief valve
4 Oil anti-cavitation device
5 Gas vent valve

pk_2_142

3.0 Overview Process Metering Pumps

3.0.3 Installation Applications

A	Oil industry		
A1	Well	B	Gas industry
A2	Platform	B1	Well
A3	Transportation (tanker, pipeline)	B2	Gas treatment/gas drying
A4	Refinery	B3	Transportation (tanker, pipeline)
A5	Petrochemical	B4	Gas storage tank
A6	Industry/power plants	B5	Local distribution/odorization
A7	Filling stations	B6	Industry/power plants

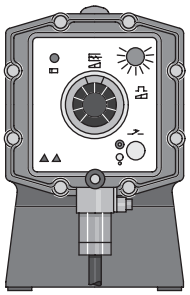


1	Valveless piston-type dosing pump DR	2	Multiplexed dosing pumps	3	Piston-type dosing pump PS	4	Hydraulic diaphragm-driven dosing pump Mh (metal diaphragm)	5	Hydraulic diaphragm-driven dosing pump Mf (PTFE diaphragm)

pk_3_07

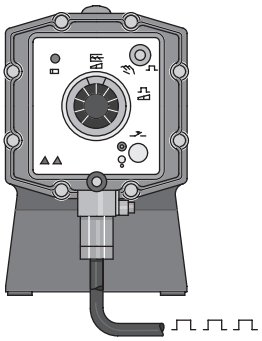
3.1 ProMinent EXtronic® Metering Pumps

3.1.1 ProMinent EXtronic® Diahpragm Metering Pumps



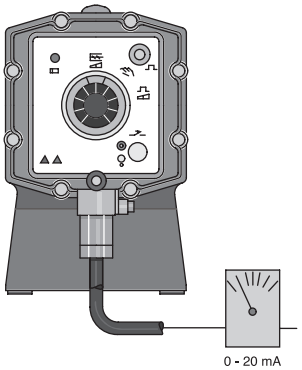
pk_1_020

Control type „Internal“ Stroke length adjustment 1:10, Stroking rate adjustment 1:25 ,total adjustment range 1:250.



pk_1_019

Control type „External Contact“ Stroke length adjustment 1:10, Stroke frequency control 0 - 100% dependant upon external switch contacts. *)



pk_1_018

Control type „Analogue“ Stroke length adjustment 1:10, Stroke frequency control 0 - 100% proportional to analogue signal 0/4 - 20 mA. *)

*) The electrical cables for mains connection, contact or analogue control are already connected to the pump. Observe all instructions concerning connecting and activating electrical systems.

The ProMinent EXtronic® series approved according to the new EG-EX-directive 94/9/EG (ATEX), for metering fluids in gas explosion endangered operations and storm endangered mining operations.

- Operating voltage 500 V. The application field for ProMinent EXtronic® equipment is thereby expanded, e.g. in conjunction with the
- new EXBb M version for storm endangered mining operations.
- The short stroke solenoid action is combined with the liquid ends from the gamma series. The SB material version is recommended for use with flammable media.
- The control inputs “external contact”, “analog” and “zero volts ON/OFF” are intrinsically safe for EXBb - registered in accordance with EN 50020 - available.
- The 2501 SSM/SBM type with diaphragm rupture signalling e.g. for use in gas odorization.

The capacity ranges from 0.19 l/h to 60 l/h at back pressures of max. 25 bar.

The ProMinent EXtronic® conforms to the unified EU standard EN 50014/50018 for “flameproof enclosure”. It carries the highest enclosure class for this protection type. This standard is recognised in many other countries outside the EU.

The short stroke solenoid and the pump controller are housed inside the pump housing. Conforms to DIN 40050 standards on contact and moisture resistance, and carries IP 65 protection, even when front cover is open.

Key:

6 resistant to dust entry and complete resistance to contact

5 resistant to spray water from all directions

The liquid end with the proven DEVELOPAN® pump diaphragm with Teflon coating and the proven liquid ends in Acrylic, Polypropylene (PP), PTFE-Teflon®, stainless steel no. 1.4404 and SB for flammable chemicals, according to requirements, bring the highest levels of operating safety to ProMinent EXtronic® dosing pumps.

Self bleeding liquid ends for gaseous chemicals are available in Acrylic (NS) and PVC (PS).

The micrometer stroke length adjustment knob ensures precise and high reproducibility. There is also a comprehensive range of explosion proof accessories and pump accessories available.

EXBb G for use in gas and fire damp endangered areas Protection Grade EEx [i, a] d IIC T6

Key:

EEx	-	explosion proof equipment conforms to European Standards
[i, a]	-	control input intrinsically safe in case of occurrence of two unrelated faults
d	-	fire proofing; flameproof enclosure
IIC	-	explosion group II for all explosion endangered areas apart from mining, sub group IIC (includes IIA and IIB)
T6	-	temperature class, permitted for gas and moisture with ignition temperature > 85 °C

EXBb M for use in storm endangered mining operations Protection grade EEX d I/II C T6

Key:

EEx	-	explosion proof equipment conforms to European Standards
d	-	fire proofing, flameproof enclosure
IC	-	explosion group I for firedamp endangered operations
IIC	-	explosion group II for all other hazardous locations, sub group IIC (includes IIA and IIB)
T6	-	temperature class, permitted for gas and moisture with ignition temperature > 85 °C. This is the highest temperature class, and includes T1 to T5

3.1 ProMinent EXtronic® Metering Pumps

Technical data

Type	Delivery rate at max. backpressure			Delivery rate at medium backpressure			Number of strokes	oØ x iØ	Suction head	Shipping weight PP,NP,TT-SS
EXBb	bar	l/h	ml/stroke	bar	l/h	ml/stroke	Strokes/min	mm	mWC	kg
1000	10	0.19	0.03	5.0	0.27	0.04	120	6 x 4	1.5	12
2501	25	1.00	0.15	20.0	1.10	0.17	120	6 x 4	6.0	
1601	16	1.10	0.15	8.0	1.30	0.18	120	6 x 4	6.0	12
1201	12	1.70	0.23	6.0	2.00	0.28	120	6 x 4	6.0	12
0803	8	3.70	0.51	4.0	3.90	0.54	120	6 x 4	3.0	12
1002	10	2.30	0.31	5.0	2.70	0.38	120	8 x 5	6.0	12
0308	3	8.60	1.20	1.5	10.30	1.43	120	8 x 5	6.0	12
2502	25	2.00	0.28	20.0	2.20	0.31	120	8 x 5	6.0	13
1006	10	6.00	0.83	5.0	7.20	1.00	120	8 x 5	6.0	13
0613	6	13.10	1.82	3.0	14.90	2.07	120	8 x 5	5.5	13
0417	3.5	17.40	2.42	2.0	17.90	2.49	120	12 x 9	4.5	13
2505	25	4.20	0.64	20.0	4.80	0.73	110	8 x 5	6.0	16
1310	13	10.50	1.59	6.0	11.90	1.80	110	8 x 5	6.0	16
0814	8	14.00	2.12	4.0	15.40	2.33	110	12 x 9	6.0	16
0430	3.5	27.00	4.09	2.0	29.50	4.47	110	DN 10	5.0	16
0260	1.5	60.00	9.09				110	DN 15	1.5	16
EXtronic® metering pumps for high viscosity media										
1002	10	2.30	0.31	5.0	2.70	0.38	120	DN 10		
1006	10	6.00	0.83	5.0	7.20	1.00	120	DN 10		
1310	10	10.50	1.59	5.0	11.90	1.80	110	DN 15		
0814	8	14.00	2.12	4.0	15.40	2.33	110	DN 15		
EXtronic® metering pumps with self-venting liquid end										
1601	16	0.66	0.09				120	6 x 4	1.8	
1201	12	1.00	0.14				120	6 x 4	2.0	
0803	8	2.40	0.33				120	6 x 4	2.8	
1002	10	1.80	0.25				120	6 x 4	2.0	

* shipping weight for EXBb M version… additional 14 kg

** The data given here represent guaranteed minimum values, achieved with medium water at room temperature.

Materials In Contact With Chemicals

	Liquid End	Suction/Discharge Connector	Seals	Valve Balls (Connector 6-12 mm)	Balls (DN 10 and DN 15 Connector)
PP1	Polypropylene	Polypropylene	EPDM	ceramic	Borosilicate glass
PP4	Polypropylene	Polypropylene	EPDM	-	ceramic
NP1	Acrylic	PVC	FPM A	ceramic	Borosilicate glass
NP3	Acrylic	PVC	FPM B	ceramic	-
NS3**	Acrylic	PVC	FPM B	ceramic	-
PS3**	PVC	PVC	FPM B	ceramic	-
TT1	PTFE with carbon	PTFE with carbon	PTFE	ceramic	ceramic
SS ..	stainless steel no. 1.4404	stainless steel no. 1.4404	PTFE	ceramic	stainless steel no. 1.4404

* PP4 with Hastelloy C valve springs.

** NS3 and PS3 with Hastelloy C valve springs, PVDF valve core.
FPM = Fluorine Rubber

3.1 ProMinent EXtronic® Metering Pumps

3.1.2 Identcode Ordering System

EXBb	Enclosure rating								
	G	Gas-EX-proof							
	M	Fire and explosion protection, permitted liquid end material: stainless steel and PTFE							
		Capacity							
			bar	**l/h**					
		1000	10	0.19					
		2501	25	1.00	(only available in SSM and SBM)				
		1601	16	1.10					
		1201	12	1.70					
		0803	8	3.70					
		1002	10	2.30					
		0308	3	8.60					
		2502	25	2.00					
		1006	10	6.00	(available in SS and SB only)				
		0613	6	13.10					
		0417	4	17.40					
		2505	25	4.20	(only available in SS and SB)				
		1310	13	10.50	(only available in NP, PP4, SS and SB)				
		0814	8	14.00					
		0430	4	27.00					
		0260	2	60.00					
			Liquid end material						
			PP1	Polypropylene with EPDM O-ring					
			PP4	HV Polypropylene for high viscosity liquids with EPDM O-ring and Hastelloy C valve springs (Types 1002, 1006, 1310 and 0814 only)					
			NP1	Acrylic with FPM A O-ring *					
			NP3	Acrylic with FPM B O-ring					
			NS3	Acrylic with FPM B O-ring, self bleeding (Types 1601, 1201, 0803 and 1002 only)					
			PS3	PVC with FPM B O-ring, self bleeding (Types 1601, 1201, 0803 and 1002 only)					
			TT1	PTFE with carbon, PTFE seal					
			SS1	Stainless steel, no. 1.4404, with PTFE seal					
			SS2	Stainless steel with 1/4" NPT internal thread, PTFE seal					
			SB1	Stainless steel with ISO 7 Rp 1/4 internal thread, ISO 7 Rp 1/2 on type 0260, PTFE seal (recommended for flammable materials)					
			SSM	as SS1, with diaphragm rupture indicator Type 2501 only					
			SBM	as SB1, with diaphragm rupture indicator Type 2501 only					
				Valve springs					
				0	No springs				
				1	With 2 valve springs, 1.4571, 0.1 bar				
					Electrical connection				
					A	230 V, 50/60 Hz			
					B	115 V, 50/60 Hz			
					E	500 V, 50/60 Hz			
						Cable length 5m, open end			
						Control type			
						0	manual stroking rate adjustment via potentiometer		
						1	External contact		
						2	Analogue 0-20 mA		
						3	Analogue 4-20 mA		
						4	External contact, intrinsically safe [i,a]		
						5	Analogue 0-20 mA, intrinsically safe [i,a]		
						6	Analogue 4-20 mA, intrinsically safe [i,a]		
						7	manual with zero volts ON/OFF		
						8	manual with zero volts ON/OFF, intrinsically safe [i,a]		
							Control Variants		
							0	With potentiometer (control type 0, 7 and 8 only)	
							1	With manual auxiliary key for maximum stroking rate (control type 1-6 only)	
							2	With manual auxiliary frequency changer key for maximum stroking rate (control type 1-6 only)	
								Approved/Language	
								0	BVS - Europe, German, 100 V - 500 V
								1	BVS - Europe, English, 100 V - 500 V
								2	FM - USA, English, 115 V
								3	CSA - Canada, English, 115 V, 230 V

* FPM = Fluorine Rubber

3.1 ProMinent EXtronic® Metering Pumps

Connectors

PP, NP, NS, PS and TT	6, 8 and 12 mm	hose sleeve with clamping ring fitting
SS1/SSM stainless steel	6, 8 and 12 mm	Swagelok screw fitting system
SS2 stainless steel	6, 8 and 12 mm	internal thread 1/4“ NPT
SB1/SBM stainless steel	6, 8 and 12 mm	internal thread ISO 7 Rp 1/4
PP and NP	DN 10 and DN 15	hose sleeve d 16 - DN 10 and d 20 - DN 15
TT	DN 10 and DN 15	fusion joint d 16 - DN 10 and d 20 - DN 15 (PVDF)
SS1 stainless steel	DN 10 and DN 15	insert, internal thread R 3/8 and R 1/2
SB1 stainless steel	DN 10 and DN 15	internal thread ISO 7 Rp 1/4 and 1/2

Reproducible metering accuracy ±2 % when correctly installed, refer to operating instructions manual.

±5 % for type 1601 with self bleeding liquid end.

Permissible ambient temperature -10 °C to +45 °C.

Power supply: 500 V ±6 %, 50/60 Hz
230 V ±10 %, 50/60 Hz
115 V ±10%, 50/60 Hz

Protection: IP 65, insulation class F

Medium power consumption at max. stroking rate (W)/peak power consumption at dosing stoke (A) at 230 V, 50/60 Hz:

EXBb	Type 1000, 2501, 1601, 1201, 0803, 1002, 0308	13 W/0.7 A	at 120 strokes/min
EXBb	Type 2502, 1006, 0613, 0417	26 W/1.7 A	at 120 strokes/min
EXBb	Type 2505, 1310, 1014, 0430, 0260	45 W/2.0 A	at 110 strokes/min

Included in delivery: Dosing pump with 5 m mains cable, connector set for hose/pipe connections as described in tables.

3.1.3 Spare Parts Kits

Spare parts kits ProMinent EXtronic®

Supplied for PP and NP versions:
1 pump diaphragm
1 suction valve compl.
1 discharge valve compl.
2 valve balls
1 seal set
1 connector set

Supplied for TT-PTFE versions:
1 pump diaphragm
1 suction valve compl.
1 discharge valve compl.
2 valve balls
2 ball seat discs
1 seal set
1 connector set

Supplied for NS3 and PS3 versions:
1 pump diaphragm
1 suction valve compl.
1 connector parts set
1 discharge valve compl.
1 bleeding valve set
1 connector set

Supplied for SS stainless steel versions:
1 pump diaphragm
4 valve balls
4 ball seat discs
1 seal set
1 connector set

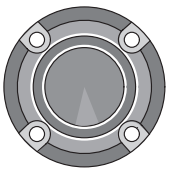
Pump type	Materials in contact with medium	Order no.
EXBb 1000	PP1	740357
	NP3	740354
	TT	910776
	SS/SK	910777
EXBb 2501	SBM	1020281
	SSM	1020282
EXBb 1601	PP1	740361
	NP3	740358

3.1 ProMinent EXtronic® Metering Pumps

Pump type	Materials in contact with medium	Order no.
	NS3/PS3	792033
	TT	910778
	SS1/SK	910779
EXBb 1201	PP1	740380
	NP3	740362
	NS3/PS3	792034
	TT	910780
	SS/SK	910781
EXBb 0803	PP1	740384
	NP3	740381
	NS3/PS3	792035
	TT	910782
	SS1	910783
EXBb 1002/2502	PP1	740388
	NP3	740385
	NS3/PS3	792036
	TT	910784
	SS	910785
	HV/PP 4 (Type 1002)	910743
EXBb 0308/1006/2505	PP1	740497
	NP1	740498
	TT	910957
	SS1	910959
	HV/PP4 (Type 1006)	910939
EXBb 0613/1310	PP1	740504
	NP1	740505
	TT1	910969
	SS1	910971
	HV/PP4 (Type 1310)	910941
EXBb 0417/0814	PP1	740501
	NP1	740502
	TT	910977
	SS1	910979
	HV/PP4	910943
EXBb 0430-DN 10	PP1	740507
	NP1	740508
	TT	910993
	SS1	910995

Replacement parts set as DN 10 with one way ball valves.

3.1 ProMinent EXtronic® Metering Pumps



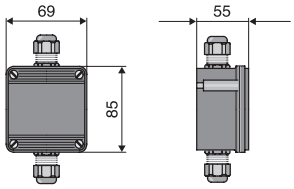
pk_1_008

PTFE pump diaphragms

ProMinent® DEVELOPAN® pump diaphragms in EPDM with woven inner layer, integrally vulcanised steel core and PTFE Teflon coating on the side in contact with the dosing chemical.

For pump type	Description	Order no.
1000	31.0 x 6.0	811453
2501	35.0 x 11.5	1000246
1601	48.0 x 9.5	811453
1201	48.0 x 12.5	811454
0803	48.0 x 18.5	811455
1002, 2502	60.0 x 17.0	811456
0308, 2505, 1006	60.0 x 28.0	811457
1310, 0613	76.0 x 37.0	811458
0814, 0417	76.0 x 45.0	811459
0430, 0230	127.5 x 63.0	811460
0260	127.5 x 91.0	811461

3.1.4 Ex-Proof Ancillary Equipment

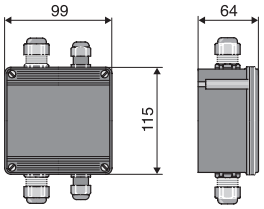


pk_1_023

Plastic terminal box: Type I

IP 66, EEx e II T 6, max. 380 V mains connection, e.g. of ProMinent EXtronic® in hazardous locations.

	Order no.
1 input, 1 output for power supply cable. 2 terminals + PE and 2 M 20-12 screw glands	1000071

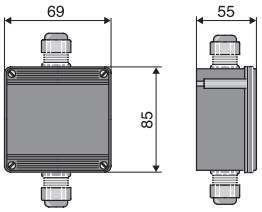


pk_1_021

Plastic terminal box: Type II

IP 6, EEx e II T 6, max. 380 V. As type I, but with additional connector for controller cable (e.g. for contact water meter or DULCOMETER® controller).

	Order no.
2 inputs (mains and controller cable), 2 outputs 2 terminals + PE, 1 partition, 2 terminals and 2 M 20-12 screw glands and 2 M 16-0.8 screw glands	1000072



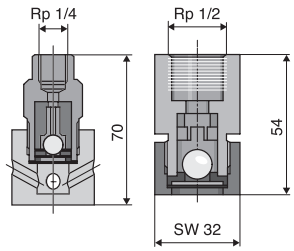
pk_1_022

Plastic terminal box: EExi Type I

IP 66, EEx ia II T 6 for intrinsically safe controller cable

	Order no.
1 input, 1 output for controller cable, 2 terminals and 2 M 16-0.8, blue screw glands	1000073

3.1 ProMinent EXtronic® Metering Pumps

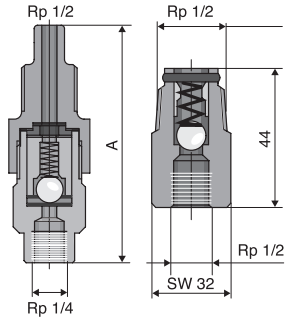


pk_1_30 / pk_1_031

Stainless steel foot valve 1.4404 „SB“

With filter and ball check valve, designed for use with flammable materials. Materials: 1.4404/1.4401/ PTFE/ceramic

	Order no.
Connector ISO 7 Rp 1/4 SB version for ProMinent EXtronic®	809301
Connector ISO 7 Rp 1/2 SB version for ProMinent EXtronic®	924561

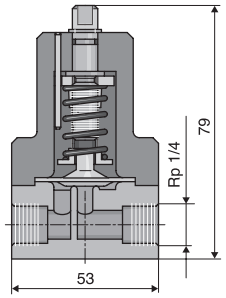


pk_1_032_2 / pk_1_027

Stainless steel 1.4404 "SB" dosing valve

Spring loaded ball check valve designed for use with flammable materials. Materials: 1.4404/1.4401/ Hastelloy C/PTFE/ceramic

	Order no.
Connector ISO 7 Rp 1/4 - R 1/2, pre-pressure approx. 0.5 bar	809302
Connector ISO 7 Rp 1/2 - R 1/2, pre-pressure approx. 0.5 bar	924560



pk_1_029

Adjustable „SB“ back pressure valve

	Order no.
Operating range approx. 1-10 bar, closed version, designed for use with flammable materials.	924555

To generate a constant back pressure for accurate dosing with a free outlet. Can also be used as an overflow valve.

PTFE dosing pipe

Carbon-filled, surface resistance < 10^7 Ω

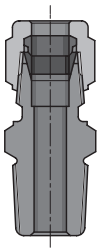
Material	Length	Connection size o ∅ x i ∅	Permissible operating pressure	Order no.
	m	mm	bar	
PTFE	By the metre	6.0 x 4.0	12*	1024831
	By the metre	8.0 x 5.0	16*	1024830
	By the metre	12.0 x 9.0	9*	1024832

* permissible operating pressure at 20 °C in accordance with EN ISO 7751, ¼ of the bursting pressure, assuming chemical resistance and correct connection.

Additional ancillary equipment, i.e. foot valves, dosing valves and back pressure valves in the usual material combinations, identical to gamma ancillary equipment and/or for connector DN 15 Vario ancillary equipment.

(Motor Driven Metering Pumps Hydraulic/Mechanical Accessories see p. → 2-25)

3.1 ProMinent EXtronic® Metering Pumps



pk_1_028

Stainless steel straight threaded connectors

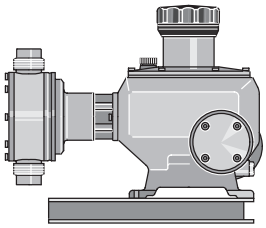
Swagelok system in stainless steel SS 316 (1.4401) for connection of pipework to liquid ends and valves with internal thread and for SB version.

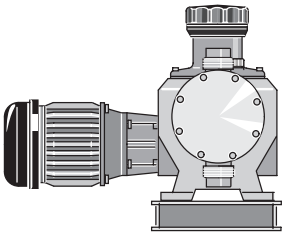
Normal thread seal compounds required.

	Order no.
6 mm - ISO 7 R 1/4	359526
8 mm - ISO 7 R 1/4	359527
12 mm - ISO 7 R 1/4	359528
16 mm - ISO 7 R 1/2	359529

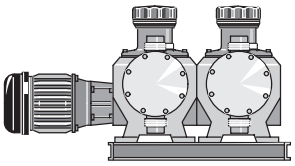
3.2 Makro TZ Diaphragm Metering Pumps

3.2.1 Makro TZ Motor Driven Diaphragm Metering Pumps

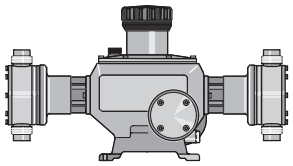




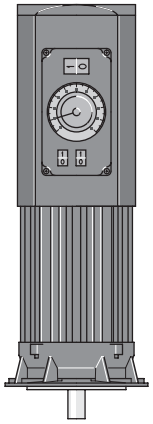
pk_2_012



pk_2_013



pk_2_014



pk_2_103

The Makro TZ diaphragm metering pump is a 0.75 kW dual-wound three phase motor driven metering pump, 230/400 V, 50/60 Hz, enclosure rating IP 55, insulation class F.

The stroke length can be adjusted by means of the shift ring mechanism from 0-10 mm (TZMb), with 0.5 % accuracy. The 5-speed gearbox is encased in a cast, seawater resistant, acrylic resin lacquered housing. Liquid ends are available in different material combinations to suit differing applications. The suction lift varies according to the density and viscosity of the medium, the dimension of the pipework and the pump stroke rate. Reproducibility of metering is better than ±2 % in the stroke length range from 30 % -100 % subject to defined conditions and correct installation. (You must follow the instructions in the operating instruction manual). All motor driven metering pumps must be fitted with appropriate cut-out systems for safety reasons.

Makro TZ TZMbA Add-On Pumps

The Makro TZ main diaphragm metering pump can be converted to a duplex or triplex pump with the Makro TZ add-on diaphragm pump (several add-on pumps can be operated at reduced back pressure). Multiplex pumps can also be retrofitted by the operator; all the necessary components and fittings are included with the TZMbA. Different stroke rates can be achieved with the add-on pump independently of the main pump as each TZMbA has its own reducing gear. The main power end can be fitted for this purpose with a more powerful drive motor. A base frame is required when using add-on power ends.

Makro TZ Double Head Version TZMbD/TZMbB

The double head version of the Makro TZ is similar to the simplex pump.

It is, however, fitted with a second liquid end. The liquid ends work in push-pull mode by means of a coupling element in the gearbox.

Actuation of Makro TZ Metering Pumps

Makro TZ stroke length-actuator/stroke controller

Makro TZ stroke actuator

Stroke adjustment motor for automatic stroke length adjustment, adjustment time approx. 1 sec. for 1 % stroke length, fitted with 2 limit switches for min. /max. setting, 1 kΩ feedback potentiometer; enclosure rating: IP 54. Power supply 230 V (±10 %), 50/60 Hz, 40 W. Mech. stroke length indicator fitted to Makro TZ power end.

Alternative current / higher enclosure rating / Ex-protection to order.

Makro TZ stroke controller

Stroke controller comprising actuator with stroke adjustment motor and integrated microprocessor controller for stroke length adjustment via a standard signal. Technical data see actuator.

Version: Standard 0/4-20 mA current input, corresponds to 0-100 % stroke length. Change over switch for manual/automatic mode. Key switch for stroke adjustment in manual operating mode. 0/4-20 mA actual value output for remote display.

Variable speed motors with integrated frequency converter (Identcode characteristic V)

Power supply 1 ph 230 V, 50/60 Hz, 1.5 kW.

Optional 0/4-20 mA external control. (see Fig. pk_2_103)

(Speed Controllers see p. → 2-50)

Speed controllers in metal housing (Identcode characteristic Z)

The speed controller kit comprises a frequency converter in a separate metal housing and 1.5 kW variable speed motor.

(Speed Controllers see p. → 2-50)

3.2 Makro TZ Diaphragm Metering Pumps

3.2.2 Identcode Ordering System

Motor-Driven Metering Pump TZMb Makro TZ 10 (mechanically driven add-on diaphragm pump)

TZMb	Drive type													
	H	Main drive												
	A	Add-on drive												
	D	Double main drive												
	B	Double add-on drive												
		Type*												
		120260	070430	040840										
		120340	070570	041100										
		120430	070720	041400										
		120510	070860	041670										
		120650	071070	042100**										
			Material Liquid end											
			PC	PVC										
			PP	Polypropylene										
			SS	Stainless steel										
			TT	PTFE + 25% carbon										
				Seals/diaphragm material										
				T	PTFE									
					Diaphragm									
					1	Multi-layer safety diaphragm with rupture indicator								
						Liquid end version								
						0	No valve springs							
						1	With valve springs							
							Hydraulic connection							
							0	Standard connection						
							1	PVC union nut and insert						
							2	PP union nut and insert						
							3	PVDF union nut and insert						
							4	SS union nut and insert						
								Version						
								0	with ProMinent® logo					
								2	no ProMinent® logo					
								A	with ProMinent® logo, with frame, simplex					
								B	with ProMinent® logo, with frame, duplex					
								C	with ProMinent® logo, with frame, triplex					
								M	Modified					
									Electrical power supply					
									S	3 ph. 230/400 V 50/60 Hz (WBS)				
									P	3 ph. 230/400 V 60 Hz (Exe, Exde)				
									L	3 ph. 230/400 V 50 Hz (Exe, Exde)				
									R	Variable speed motor4 pole230/400 V				
									V (0)	Variable speed motor with integr. frequency converter				
									V (2)	variable speed motor with integr. frequency converter (Exde)				
									Z	Speed control kit				
									4	No motor, with 56 C flange				
									7	No motor, with 120/80 flange				
									8	No motor, with 160/90 flange				
									0	No motor, externally mounted drive				
										Enclosure rating				
										0	IP 55 (Standard) ISO class F			
										1	Exe version ATEX-T3			
										2	Exde version ATEX-T4			
										A	ATEX power end			
											Stroke sensor			
											0	No stroke sensor		
											1	With stroke sensor (Namur)		
												Stroke length adjustment		
												0	Stroke length adjustment, man.	
												1	230 V stroke actuator	
												2	115 V stroke actuator	
												3	230 V 0-20 mA stroke controller	
												4	230 V 4-20 mA stroke controller	
												5	115 V 0-20 mA stroke controller	
												6	115 V 4-20 mA stroke controller (servo motors for Ex zones on request)	
													Application	
													0	Standard

* digits 1 + 2 = back pressure [bar], digits 3 - 6 = feed rate [l/h]

** material version PCT/PPT/TTT max. 10 bar

3.2 Makro TZ Diaphragm Metering Pumps

Technical data

Type TZMbH	With motor 1500 rpm at 50 Hz				With motor 1800 rpm at 60 Hz				Suction head	Connection, intake/ pressure side	Versandgewicht PP,NP,TT-SS
	Delivery rate at max. backpressure		Max. stroke rate		Delivery rate at max. backpressure			Number of strokes at max. backpressure			
	bar	l/h	ml/stroke	Strokes/ min	psi	l/h	gph	Strokes/ min	mWC	G–DN	kg
120260	12	260	60	72	174	312	82	86	4.0	1 1/2–25	46/54
120340	12	340	60	96	174	408	108	115	4.0	1 1/2–25	46/54
120430	12	430	60	120	174	516	136	144	4.0	1 1/2–25	46/54
120510	12	510	60	144	174	612	162	173	4.0	1 1/2–25	46/54
120650	12	640	60	180	174				4.0	1 1/2–25	46/54
070430	7	430	99	72	100	516	136	86	3.5	2–32	50/64
070570	7	570	99	96	100	684	181	115	3.5	2–32	50/64
070720	7	720	99	120	100	864	228	144	3.5	2–32	50/64
070860	7	860	99	144	100	1,032	273	173	3.5	2–32	50/64
071070	7	1,070	99	180	100				3.5	2–32	50/64
040840	4	840	194	72	58	1,008	266	86	3.0	2 1/4–40	56/80
041100	4	1,100	194	96	58	1,320	349	115	3.0	2 1/4–40	56/80
041400	4	1,400	194	120	58	1,680	444	144	3.0	2 1/4–40	56/80
041670	4	1,670	194	144	58	2,004	529	173	3.0	2 1/4–40	56/80
042100	4	2,100	194	180	58				3.0	2 1/4–40	56/80

Stroke length 10 mm

Polymer version: max. 10 bar back pressure

The admissible priming pressure on the suction side is 50 % of the maximum back pressure.

Materials In Contact With Chemicals

			DN 25 Ball Valves			DN 32/DN 40 Plate Valves**		
	Dosing Head	Suction/ Discharge Connector	Seals	Valve Balls	Valve Seat	Seals	Valve Plate/Valve Spring	Valve Seat
PPT	Polypropylene	PVDF	PTFE	Borosilicate glass	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
PCT	PVC	PVDF	PTFE	Borosilicate glass	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
TTT	PTFE with carbon	PVDF	PTFE	Ceramic	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
SST	Stainless steel no. 1.4571/1.4404	Stainless steel no. 1.4581	PTFE	Stainless steel no. 1.4401	PTFE	PTFE	Stainless steel 1.4404/ Hast. C	PTFE

Multi-layer safety diaphragm with PTFE coating

** The valve spring is coated with CTFE (similar to PTFE)
Custom designs available on request.

3.2 Makro TZ Diaphragm Metering Pumps

Motor Data

Identcode characteristic		Power supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	0.75 kW	
		250-280 V/440-480 V	60 Hz	0.75 kW	
L1	3 ph, II2GEExeIIT3	220-240 V/380-420 V	50 Hz	0.75 kW	
L2	3 ph, II2GEExdIICT4	220-240 V/380-420 V	50 Hz	0.75 kW	with PTC thermistor, speed adjustment range 1:5
P1	3 ph, II2GEExeIIT3	250-280 V/440-480 V	60 Hz	0.75 kW	
P2	3 ph, II2GEExdIICT4	250-280 V/440-480 V	60 Hz	0.75 kW	with PTC thermistor, speed adjustment range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	1.5 kW	with PTC thermistor, speed adjustment range 1:20 with external fan 1 ph 230 V; 50/60 Hz
V0	1 ph, IP 55	230 V ± 5 %	50/60 Hz	1.1 kW	variable speed motor with integrated frequency converter
V2	3 ph, II2GEExdIICT4	400 V ±10 %	50/60 Hz	1.5 kW	Ex variable-speed motor with integrated frequency converter

For further information you can request motor data sheets.
Custom motors and/or custom motor flanges are available on request.

3.2.3 Spare Parts Kits

The spare parts kit generally includes liquid end consumables.

1 pump diaphragm
1 suction valve assembly.
1 discharge valve assembly
2 valve balls (Multi-layer safety diaphragm DN 32/DN 40 with shim and springs)
1 set of seals (O-rings, ball seat discs, ball seat housings)

Spare Parts Kits TZ (TZMb)

Identcode: 120260, 120340, 120430, 120510, 120650

Delivery unit	Materials in contact with medium	Order no.
FM 670 - DN 25	PCT, PPT, TTT	1025164
	SST	1022896
	SST (without valve cpl.)	1022895

Identcode: 070430, 070570, 070720, 070860, 071070

Delivery unit	Materials in contact with medium	Order no.
FM 1100 - DN 32	PCT, PPT, TTT	1025167
	SST	1022917
	SST (without valve cpl.)	1022916

Identcode: 040840, 041100, 041400, 041670, 042100

Delivery unit	Materials in contact with medium	Order no.
FM 2100 - DN 40	PCT, PPT, TTT	1025169
	SST	1022930
	SST (without valve cpl.)	1022929

3.2 Makro TZ Diaphragm Metering Pumps

Multi-layer safety diaphragm for TZMb

ProMinent® multi-layer safety diaphragm with diaphragm rupture indication and PTFE Teflon coating on the wetted side.

Pump type	Order no.
Identcode: 120260, 120340, 120430, 120510, 120650; Makro TZ FM 670	1022887
Identcode: 070430, 070570, 070720, 070860, 071070; Makro TZ FM 1100	1022900
Identcode: 040840, 041100, 041400, 041670, 042100; Makro TZ FM 2100	1022921

Makro TZ spare parts kits for TZMa

Identcode: 120190, 120254, 120317, 120381

Delivery unit	Materials in contact with medium	Order no.
Liquid end FM 530 - DN 25	PP	910452
	P	910455
	T	910458
	S (without valve cpl.)	910475
	S	910461

Identcode: 060397, 060529, 060661, 060793

Delivery unit	Materials in contact with medium	Order no.
Liquid end FM 530 - DN 25	PP	910453
	P	910456
	T	910459
	S (without valve cpl.)	910476
	S	910462

Identcode: 030750, 031000, 031250, 031500, 031875, 031050 , 031395, 031740, 032100, 032500

Delivery unit	Materials in contact with medium	Order no.
Liquid end FM 1500/2100 - DN 40	PP	1001573
	P	1001574
	T	1001575
	S (without valve cpl.)	1001577
	S	1001576

3.2 Makro TZ Diaphragm Metering Pumps

PTFE pump diaphragms for TZMa

ProMinent® DEVELOPAN® pump diaphragms with a generously-sized steel core vulcanised into fibre reinforced EPDM, with a PTFE Teflon coating on the process-wetted side.

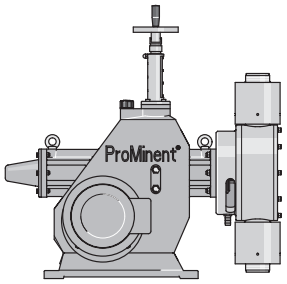
Pump type	Order no.
Identcode: 100190, 120190, 100254, 100317, 120317, 100381, 120381; Makro TZ FM 260	811471
Identcode: 060397, 060529, 060661, 060793; Makro TZ FM 530	811472
Identcode: 030750, 031000, 031250, 031500, 031050, 031395, 031740, 032100, 032500; Makro TZ FM 1500/FM 2100	811473

Note concerning installation in Ex-zones:

With effect from 01.07.2003, only pumps with a suitable identification and rating plate in accordance with ATEX Directive 94/9/EC may be used in areas with potentially explosive atmospheres. The explosion group, category and degree of protection stated on the rating plate must correspond to, or be higher than, the conditions specified in the intended application.

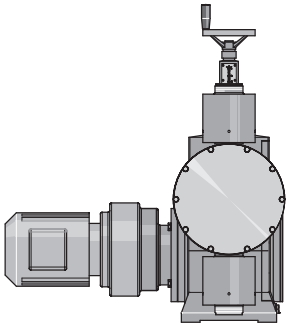
3.3 Makro/ 5 Diaphragm Metering Pumps

3.3.1 Makro/ 5 Diaphragm Metering Pumps



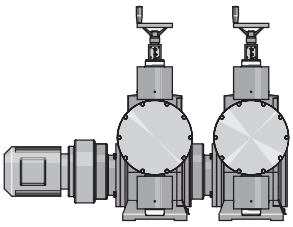
pk_2_099

The Makro/ 5 HM is supplied as standard with a 3 kW spur wheel geared 3-phase motor, 230/400 V, 50/60 Hz, enclosure rating IP 55, insulation class F. The stroke length can be adjusted between 0…20 mm. The gearbox is encased in a seawater resistant acrylic resin lacquered cast housing. The diaphragm liquid ends are available in different material combinations which are suited to different applications (see table). The metering reproducibility under defined conditions and if installed correctly is better than ±2 % in the stroke length range between 30-100 %. The priming lift varies with the density and viscosity of the chemical, the connection pipework and the stroking rate of the pump. For technical safety reasons, appropriate equipment must be installed to prevent current overload (instructions in the operating instruction manual must be followed).


pk_2_093

Makro/ 5 Add-On Pump M5MaA

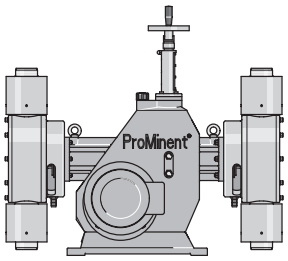
The Makro/ 5 add on pump can be connected to the Makro/ 5 main power end to form a duplex or triplex pump. (At reduced back pressure, up to four add on power ends can be combined with a main power end.) Add on power ends can be fitted on site. If required, the main drive can be fitted with a 3 kW and/ or 5.5 kW motor. You will require a base frame when connecting add on power ends.


pk_2_098

Makro/ 5 Double-Head Pump M5MaD M5MaB

Essentially the same instructions apply for the Makro/ 5 HMD and AMD pumps as for single pumps. They are, however, fitted with a second liquid end.

The liquid ends operate in counter-cycle.



pk_2_095

Makro/ 5 Pump Control

Makro/ 5 stroke length actuator

Servomotor for automatic stroke length adjustment, adjusting time approx. 100 sec. for 100 % stroke length, fitted with 2 limit switches for min./max. settings. Feedback potentiometer 1 k Ohm; enclosure rating: IP 54. Power supply 230 V (±10 %), 50/60 Hz, approx. 40 W, mech. stroke rating display at Makro/ 5 power end.

Custom voltage ratings/higher enclosure ratings/Ex-proof available on request.

Includes:

Standard signal input 0/4-20 mA, (corresponds to stroke length 0-100 %); internal switch for manual/automatic operation, key switch for stroke length adjustment in manual operating mode, actual value output 0/4-20 mA for remote display.

Frequency inverter for speed controller in metal housing, enclosure rating IP 54

Frequency inverter encased in safety housing, IP 54, with integrated controller and main switch for the stated motor output.

Optional external control via 0/4-20 mA and/or 0-10 V correspond to 0-50 (60) Hz output frequency.

Integrated controller with versatile functions including switching between external/internal control. In the case of internal control, frequency input via arrow keys, multi-lingual fault message display etc.

Incorporates equipment for monitoring motor temperature (thermistor protection).

Stroke sensor with namur signal

Mounted onto the crank drive of the Makro/ 5 gearbox. For precise detection of each metering stroke, comprising trip cam and inductive proximity switch, Namur-type switch signal. Suitable for batch metering in conjunction with electronic timers and/or for proportional metering in conjunction with proportional controller.

Retrofitting on factory premises only.

Permitted for ex-proof operation with enclosure rating EEx ia II C T6.

3.3 Makro/ 5 Diaphragm Metering Pumps

Technical data

Type M5MaH	With motor 1500 rpm at 50 Hz				With motor 1800 rpm at 60 Hz				Suction head	Connection, intake/ pressure side	Shipping weight
	Delivery rate at max. backpressure			Max. stroke rate	Delivery rate at max. backpressure			Max. stroke rate			
	bar	l/h	ml/ stroke	Strokes/ min	psi	l/h	gph	Strokes/ min	mWC	G–DN	kg
041540	4	1,540	427	60	58	1,822	481	71	3.0	2 3/4–50	320
041900	4	1,900	427	75	58	2,254	595	89	3.0	2 3/4–50	320
042600	4	2,600	427	103	58	3,104	820	123	3.0	2 3/4–50	320
043400	4	3,400	427	133	58	4,064	1,074	159	3.0	2 3/4–50	320
044000	4	4,000	427	156	58				3.0	2 3/4–50	320

Stainless steel version: Shipping weight 340 kg

The permissible admission pressure on the intake side is approx. 50 % of the maximum permissible backpressure.

Materials In Contact With Chemicals

			DN 50 Plate Valves		
	Dosing Head	Suction/ Discharge Connector	Seals	Valve Plates/ Valve Spring	Valve Seat
PPT	Polypropylene	Polypropylene	PTFE	Ceramic/Hast. C + CTFE**	PTFE
PCT	PVC	PVC	PTFE	Ceramic/Hast. C + CTFE**	PTFE
TTT	PTFE with carbon	PTFE with carbon	PTFE	Ceramic/Hast. C + CTFE**	PTFE
SST	Stainless steel no. 1.4571/ 1.4404	Stainless steel no. 1.4571/1.4404	PTFE	Stainless steel 1.4401/Hast. C	PTFE

DEVELOPAN® pump diaphragm with PTFE coating

** The valve spring is coated with CTFE (similar to PTFE)
Custom designs available to order.

Motor Data

Identcode characteristic		Power supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	3 kW	
		250-280 V/440-480 V	60 Hz	3 kW	
L1	3 ph, II2GEExeIIT3	220-240 V/380-420 V	50 Hz	3.6 kW	
L2	3 ph, II2GEExdIICT4	220-240 V/380-420 V	50 Hz	4 kW	with PTC thermistor, speed adjustment range 1:5
P1	3 ph, II2GEExeIIT3	250-280 V/440-480 V	60 Hz	3.6 kW	
P2	3 ph, II2GEExdIICT4	250-280 V/440-480 V	60 Hz	4 kW	with PTC thermistor, speed adjustment range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	3 kW	with PTC thermistor, speed adjustment range 1:5
V0	3 ph, IP 55	400 V ±10 %	50/60 Hz	3 kW	variable speed motor with integrated frequency converter
V2	3 ph, II2GEExeIICT4	400 V ±10 %	50/60 Hz	4 kW	Ex variable-speed motor with integrated frequency converter

Notice for use in Ex-zone:
After 01.07.2003, only pumps with the corresponding EC-Ex-RL 94/9 code can be used in explosion-threatened operating areas. The explosion group, category and enclosure rating indicated in the identification shall comply with or exceed the conditions in the intended place of use.

3.3 Makro/ 5 Diaphragm Metering Pumps

3.3.2 Identcode Ordering System

Motor-Driven Metering Pump M5Ma (mechanically driven diaphragm pump)

M5Ma	Drive type													
	H	Main drive												
	D	Double main drive												
	A	Add-on drive												
	B	Double add-on drive												
		Type												
		041540	4 bar, 1540 l/h											
		041900	4 bar, 1900 l/h											
		042600	4 bar, 2600 l/h											
		043400	4 bar, 3400 l/h											
		044000	4 bar, 4000 l/h											
			Material Liquid end											
			PC	PVC										
			PP	Polypropylene										
			SS	Stainless steel										
			TT	PTFE + 25 % carbon										
				Sealing material										
				T	PTFE									
					Displacement body									
					T	Pump diaphragm with PTFE coating								
						Liquid end version								
						1	With valve springs, Hast. C; 0.1 bar							
							Hydraulic connection							
							0	Standard connection						
							1	PVC union nut and insert						
							2	PP union nut and insert						
							3	PVDF union nut and insert						
							4	SS union nut and insert						
								Version						
								0	with ProMinent® logo, no frame					
								1	without ProMinent® logo, no frame					
								A	with ProMinent® logo, with frame, simplex					
								B	with ProMinent® logo, with frame, duplex					
								C	with ProMinent® logo, with frame, triplex					
								D	with ProMinent® logo, with frame, quadruplex					
								M	Modified					
									Electrical power supply					
									S	3 ph. 230/400 V 50/60 Hz (WBS)				
									P	3 ph. 460 V 60 Hz (Exe, Exd)				
									L	3 ph. 230/400 V 50 Hz (Exe, Exd)				
									R	Variable speed motor 4 pole 230/400 V (R 1:5)				
									V (0)	Variable-speed motor with integrated frequency converter				
									V (2)	Variable speed motor with integr. frequency converter (Exd)				
									5	No motor, with IEC 100 gearbox				
									6	No motor, with IEC 112 gearbox				
									0	No motor, no gearbox				
										Enclosure rating				
										0	IP 55 (Standard) ISO class F			
										1	Exe version ATEX-T3			
										2	Exd version ATEX-T4			
										A	ATEX power end			
											Stroke sensor			
											0	No stroke sensor		
											1	With stroke sensor (Namur)		
												Stroke length adjustment		
												0	Stroke length adjustment, man.	
												3	230 V 0-20 mA stroke controller	
												4	230 V 4-20 mA stroke controller	
												5	115 V 0-20 mA stroke controller	
												6	115 V 4-20 mA stroke controller	
													Application	
													0	Standard

3.3 Makro/ 5 Diaphragm Metering Pumps

3.3.3 Spare Parts Kits

The spare parts kit generally contains consumable components required for the liquid ends.

1 pump diaphragm
1 suction valve assembly.
1 discharge valve assembly
2 valve plate and Hast. C spring
1 set of seals (packing rings, valve seat; valve seat housing)

Spare parts kit Makro/ 5 HM

Delivery unit	Order no.
FM 4000 PCT	1008172
FM 4000 PPT	1008171
FM 4000 TTT	1008173
FM 4000 SST (without valves cpl.)	1008174

PTFE metering diaphragm

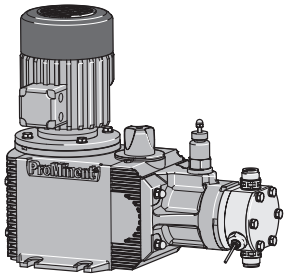
DEVELOPAN® diaphragm made of EPDM with woven fabric inlay, large-area, vulcanised aluminium core and PTFE-Teflon layer on the side in contact with the medium.

	Order no.
Metering diaphragm for Makro/ 5 FM 4000	1009023

3.4 Hydro Hydraulic Diaphragm Metering Pumps

3.4.1 Hydro Hydraulic Diaphragm Metering Pumps

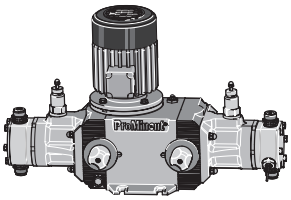
Hydro main pump H



pk_2_074

The hydraulic diaphragm metering pump is a standard sized metering pump with a 0.37/0.75 kW dual wound three phase motor, 230/400 V, 50/60 Hz, enclosure rating IP 55, insulation class F. The stroke length is 15 mm and is adjustable within 1 % accuracy. The cast aluminium housing is combined at any one time with 4 gear reductions. Comes in 2 liquid end sizes and 2 liquid end materials. All pump types are standard sized and fitted with a preset bypass valve integrated into the hydraulics, as well as a multi-layer diaphragm with diaphragm rupture signalling. Metering reproducibility under defined conditions and when installed correctly, is better than ±1 % in a stroke length range of between 20 and 100 % (instructions in the operating instructions manual must be followed precisely).

Hydro double-head version



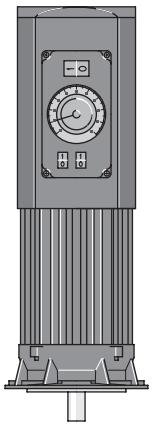
pk_2_073

The double-head version is fitted with a second liquid end which operates on a push-pull action (Boxer principle). Each liquid end is provided with a separate stroke length-adjusting knob so that each liquid end can operate at an independent feed rate.

Hydro add-on pumps

For the Hydro add-on pumps the same basic instructions apply as for the simplex pumps. A main power end can be combined with an add-on power end in both simplex and duplex forms.

Hydro Pump Controller



pk_2_103

Stroke length actuator/controller

Actuator with stroke positioning motor for automatic stroke length adjustment. Setting time approx. 1 sec. for 1 % stroke length, fitted with limit switches for min./max. settings. Resistance potentiometer 1 k Ohm for scanning the current setting. Enclosure rating IP 54.

Variable **speed controller** consisting of actuator with stroke positioning motor and inbuilt follower for stroke length adjustment via a standard signal. Standard signal current input 0/4-20 mA, corresponds to stroke length of 0-100 %. Can be switched between manual and automatic operation, key switch for stroke adjustment for manual operation, mechanical position display of stroke length actual value - output 0/4-20 mA for remote display.

Variable speed motors with integrated speed controller (Identcode characteristic V)

Power supply 1 ph, 230 V, 50/60 Hz (HP2a– 0.37 kW; HP3a– 0.75 kW). Can be externally controlled via 0/4-20 mA (see fig. pk_2_103).

The following functions are integrated into the snap on lid (see 2.17.2)

- Start/stop switch
- Manual/external switch
- Potentiometer for speed control during manual operation

Speed controllers in metal housing (Identity code characteristic Z)

Frequency changer housed in IP 55 protective housing with integrated control unit and main switch, designed for max. 0.37/0.75 kW motor output (see chapter 2.17.2).

Externally controlled with 0/4-20 mA / 0-10 V to correspond to 0-50 (60) Hz output frequency.

Integrated controller with versatile functions e.g. switching between external/internal control. In the case of internal control, frequency input via arrow keys. Multi-lingual fault message display etc. and motor temperature monitoring (thermistor-protection).

The speed controller assembly consists of a speed controller and a variable speed motor (see also identity code characteristic R).

3.4 Hydro Hydraulic Diaphragm Metering Pumps

Technical data

Type HP2aH	With motor 1500 rpm at 50 Hz				With motor 1800 rpm at 60 Hz			Suction head	Perm. admiss. pressure suction side	Connection suction/ discharge side	Shipping weight
	Delivery rate at max. backpressure			Max. stroke rate	Delivery rate at max. backpressure		Max. stroke rate				
	bar	l/h	ml/ stroke	Strokes/ min	psi	l/h / gph	Strokes/ min	mWC	bar	G–DN	kg
100003*	100	3	0.8	60	1,450	3.6/1.0	72	3.0	5	Rp 3/8–10	31
100006*	100	6	0.8	125	1,450	7.0/1.8	150	3.0	5	Rp 3/8–10	31
100007*	100	7	0.8	150	1,450	8.0/2.1	180	3.0	5	Rp 3/8–10	31
100009*	100	9	0.8	187	1,450	11.0/2.9	224	3.0	5	Rp 3/8–10	31
100010*	100	10	0.8	212				3.0	5	Rp 3/8–10	31
064007	64	7	2.0	60	928	8.4/2.2	72	3.0	5	G 3/4–10	31
064015	64	15	2.0	125	928	18.0/4.8	150	3.0	5	G 3/4–10	31
064018	64	18	2.0	150	928	21.0/5.5	180	3.0	5	G 3/4–10	31
064022	64	22	2.0	187	928	26.0/6.9	224	3.0	5	G 3/4–10	31
064025	64	25	2.0	212				3.0	5	G 3/4–10	31
025019	25	19	5.3	60	362	23.0/6.1	72	3.0	5	G 3/4–10**	31
025040	25	40	5.3	125	362	48.0/12.7	150	3.0	5	G 3/4–10**	31
025048	25	48	5.3	150	362	58.0/15.3	180	3.0	5	G 3/4–10**	31
025060	25	60	5.3	187	362	72.0/19.0	224	3.0	5	G 3/4–10**	31
025068	25	68	5.3	212				3.0	5	G 3/4–10**	31

Material version PVDF max. 25 bar.

* Material SST/HCT with double-ball valve

Optional double ball valve SST with RP 3/8

** HV version G1-DN 15

Materials In Contact With Chemicals

Material	Liquid End	Suction/Discharge connector	Seals/ball seat	Valve Balls
SST	stainless steel no. 1.4571/1.4404	stainless steel no. 1.4581	PTFE/Z_rO_2	stainless steel
PVT	PVDF (Polyvinylidenfluoride)	PVDF (Polyvinylidenfluoride)	PTFE/PTFE	ceramic
HCT	Hast. C	Hast. C	PTFE/Hast. C	ceramic

Motor Data

Identcode characteristic		Power supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	0.37 kW	
		250-280 V/440-480 V	60 Hz	0.37 kW	
L1	3 ph, II2GEExeIIT3	220-240 V/380-420 V	50 Hz	0.37 kW	
L2	3 ph, II2GEExdIICT4	220-240 V/380-420 V	50 Hz	0.37 kW	with PTC thermistor, speed adjustment range 1:5
P1	3 ph, II2GEExeIIT3	250-280 V/440-480 V	60 Hz	0.37 kW	
P2	3 ph, II2GEExdIICT4	250-280 V/440-480 V	60 Hz	0.37 kW	with PTC thermistor, speed adjustment range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	0.37 kW	with PTC thermistor, speed adjustment range 1:20 with external fan 1 ph 230 V; 50/ 60 Hz
V0	1 ph, IP 55	230 V ±10 %	50/60 Hz	0.37 kW	variable-speed motor with integrated frequency converter
V2	3 ph, II2GEExdIICT4	400 V ±10 %	50/60 Hz	0.55 kW	Ex variable-speed motor with integrated frequency converter

For further information you can request motor data sheets. Custom motors and/or custom motor flanges are available on request.

Notice for use in Ex-zone:

After 01.07.2003, only pumps with the corresponding EC-Ex-RL 94/9 code can be used in explosion-threatened operating areas. The explosion group, category and enclosure rating indicated in the identification shall comply with or exceed the conditions in the intended place of use.

3.4 Hydro Hydraulic Diaphragm Metering Pumps

3.4.2 Identcode Ordering System

Hydro/ 2 (HP2a)

HP2a	Drive type													
	H	Main drive												
	D	Main drive, Double-head version												
	E	Main drive for add on drive												
	F	Main drive, Double-head version for add-on drive												
	A	Add-on drive												
	B	Double-head version add-on drive												
		Type*												
			bar	**l/h**										
		100003	100	3	064007	64	7	025019	25	19				
		100006	100	6	064015	64	15	025040	25	40				
		100007	100	7	064018	64	18	025048	25	48				
		100009	100	9	064022	64	22	025060	25	60				
		100010	100	10	064025	64	25	025068	25	68				
			Material Liquid end											
			SS	Stainless steel										
			PV	PVDF										
			HC	Hastelloy C										
				Seals/diaphragm material										
				T	PTFE									
					Displacement body									
					0	Standard multilayer diaphragm with rupture signalling facility								
						Liquid end version								
						0	No valve springs (standard)							
						1	With valve springs							
						D	Double ball valve							
						H	HV-Version (only for 025019-025060)							
							Hydraulic connection							
							0	Standard threaded connector						
							E	With DIN ISO flange						
							F	With ANSI flange						
								Version						
								0	with ProMinent® logo					
								1	without ProMinent® logo					
								M	Modified					
									Electrical power supply					
									S	3 ph, 230/400 V, 50/60 Hz, 0,37 kW				
									L	3 ph, 230/400 V, 50 Hz (Exe, Exde), 0.37 kW				
									P	3 ph, 265/400 V, 60 Hz (Exe, Exde), 0.37 kW				
									R	3 ph, Variable speed motor, 230 V/400 V, 0.37 kW				
									V (0)	Variable speed motor with integrated frequency converter				
									V (2)	Variable speed motor with integr. frequency converter (Exde)				
									Z	1 ph, Variable speed control set, 230 V, 50/60 Hz				
									3	No motor, with B 5 flange, size 71				
									4	No motor, with C 56 flange, (NEMA)				
									0	Add on drive				
										Enclosure rating				
										0	IP 55 (standard)			
										1	Exe motor version ATEX-T3			
										2	Exde motor version ATEX-T4			
										A	ATEX power end			
											Stroke sensor			
											0	No stroke sensor (standard)		
											1	Stroke sensor (for explosion-proof applications)		
												Stroke length adjustment		
												0	Manual (standard)	
												1	With stroke positioning motor, 230 V/50/60 Hz	
												2	With stroke positioning motor, 115 V/60 Hz	
												A	With stroke control motor 0...20 mA 230 V/50/60 Hz	
												B	With stroke control motor 4...20 mA 230 V/50/60 Hz	
												C	With stroke control motor 0...20 mA 115 V/60 Hz	
												D	With stroke control motor 4...20 mA 115 V/60 Hz	
													Hydraulic oil	
													0	Standard
													1	Food products grade
													2	Low temperature to -25 °C

* PVT max. 25 bar

3.4 Hydro Hydraulic Diaphragm Metering Pumps

Technical data

Type HP3aH	With motor 1500 rpm at 50 Hz				With motor 1800 rpm at 60 Hz			Suction head	Perm. admiss. pressure suction side	Connection suction/ discharge side	Shipping weight
	Delivery rate at max. backpressure			Max. stroke rate	Delivery rate at max. backpressure		Max. stroke rate				
	bar	l/h	ml/stroke	Strokes/min	psi	l/h / gph	Strokes/min	mWC	bar	G–DN	kg
100010*	100	10	2.8	60	1,450	12.0/3.2	72	3.0	5	Rp 3/8–10	41
100021*	100	21	2.8	125	1,450	25.0/6.6	150	3.0	5	Rp 3/8–10	41
100025*	100	25	2.8	150	1,450	30.0/7.9	180	3.0	5	Rp 3/8–10	41
100031*	100	31	2.8	187	1,450	37.0/9.8	224	3.0	5	Rp 3/8–10	41
100035*	100	35	2.8	212	1,450			3.0	5	Rp 3/8–10	41
064019	64	19	5.3	60	928	23.0/6.1	72	3.0	5	G 3/4–10**	41
064040	64	40	5.3	125	928	48.0/12.7	150	3.0	5	G 3/4–10**	41
064048	64	48	5.3	150	928	58.0/15.3	180	3.0	5	G 3/4–10**	41
064060	64	60	5.3	187	928	72.0/19.0	224	3.0	5	G 3/4–10**	41
064068	64	68	5.3	212	928			3.0	5	G 3/4–10**	41
025048	25	48	13.4	60	362	58.0/15.3	72	3.0	5	G 1–15***	41
025100	25	100	13.4	125	362	120.0/31.7	150	3.0	5	G 1–15***	41
025120	25	120	13.4	150	362	144.0/38.0	180	3.0	5	G 1–15***	41
025150	25	150	13.4	187	362	180.0/47.6	224	3.0	5	G 1–15***	41
025170	25	170	13.4	212	362			3.0	5	G 1–15***	41

PVDF material version max. 25 bar.

* Material SST/HCT with double-ball valve

** HV version with 1 1/4 DN 20 connector

alternatively to G 3/4-DN 10, a double-ball valve SST with RP 3/8 is available.

*** HV version with connection G1-DN 15

Materials In Contact With Chemicals

Material	Liquid End	Suction/Discharge connector	Seals/ball seal	Valve Balls
SST	Stainless steel no. 1.4571/1.4404	Stainless steel no. 1.4581	PTFE/Z_rO_2	Stainless steel
PVT	PVDF (Polyvinylidenfluoride)	PVDF (Polyvinylidenfluoride)	PTFE/PTFE	Ceramic
HCT	Hast. C	Hast. C	PTFE/Hast. C	Ceramic

Motor Data

Identcode characteristic	Power supply				Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	0.75 kW	
		250-280 V/440-480 V	60 Hz	0.75 kW	
L1	3 ph, II2GEExeIIT3	220-240 V/380-420 V	50 Hz	0.75 kW	
L2	3 ph, II2GEExdIICT4	220-240 V/380-420 V	50 Hz	0.75 kW	with PTC thermistor, speed adjustment range 1:5
P1	3 ph, II2GEExeIIT3	250-280 V/440-480 V	60 Hz	0.75 kW	
P2	3 ph, II2GEExdIICT4	250-280 V/440-480 V	60 Hz	0.75 kW	with PTC thermistor, speed adjustment range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	0.75 kW	with PTC thermistor, speed adjustment range 1:20 with external fan 1 ph 230 V; 50/60 Hz
V0	1 ph, IP 55	230 V ±10 %	50/60 Hz	0.75 kW	variable-speed motor with integrated frequency converter
V2	3 ph, II2GEExdIICT4	400 V ±10 %	50/60 Hz		Ex variable-speed motor with integrated frequency converter

For further information you can request motor data sheets. Custom motors and/or custom motor flanges are available on request.

Notice for use in Ex-zone:

After 01.07.2003, only pumps with the corresponding EC-Ex-RL 94/9 code can be used in explosion-threatened operating areas. The explosion group, category and enclosure rating indicated in the identification shall comply with or exceed the conditions in the intended place of use.

3.4 Hydro Hydraulic Diaphragm Metering Pumps

3.4.3 Identcode Ordering System

Hydro/ 3 (HP3a)

HP3a | **Drive type**

H	Main drive
D	Main drive, Double-head version
E	Main drive for add-on drive
F	Main drive, Double-head version for add-on drive
A	Add-on drive
B	Double-head version add-on drive

Type*

	bar	l/h		bar	l/h		bar	l/h
100010	100	10	064019	64	19	025048	25	48
100021	100	21	064040	64	40	025100	25	100
100025	100	25	064048	64	48	025120	25	120
100031	100	31	064060	64	60	025150	25	150
100035	100	35	064068	64	68	025170	25	170

Material Liquid end

SS	Stainless steel
PV	PVDF
HC	Hastelloy C

Seals/diaphragm material

T	PTFE

Displacement body

0	Standard multilayer diaphragm with rupture signalling facility

Liquid end version

0	No valve springs (standard)
1	With valve springs
D	Double ball valve (for 100010-100035, 064019-064060)
H	HV-Version

Hydraulic connection

0	Standard threaded connector
E	With DIN ISO flange
F	With ANSI flange

Version

0	with ProMinent® logo
1	without ProMinent® logo
M	Modified

Electrical power supply

S	3 ph, 230/400 V, 50/60 Hz, 0.75 kW
L	3 ph, 230/400 V 50 Hz (Exe, Exde), 0.75 kW
P	3 ph, 265/440 V 60 Hz (Exe, Exde), 0.75 kW
R	3 ph, variable speed motor, 230 V/400 V, 0.75 kW
V (0)	Variable speed motor with integrated frequency converter
V (2)	Variable speed motor with integr. frequency converter (Exde)
Z	1 ph, variable speed control set, 230 V, 50/60 Hz
3	No motor, with B 5 flange, size 80
4	No motor, with C 56 flange, (NEMA)
0	Add on drive

Enclosure rating

0	IP 55 (standard)
1	Exe motor version ATEX-T3
2	Exde motor version ATEX-T4
A	ATEX power end

Stroke sensor

0	No stroke sensor (standard)
1	Stroke sensor (for explosion-proof applications)

Stroke length adjustment

0	Manual (Standard)
1	With stroke positioning motor, 230 V/50/60 Hz
2	With stroke positioning motor, 115 V/60 Hz
A	With stroke control motor 0-20 mA 230 V/50/60 Hz
B	With stroke control motor 4-20 mA 230 V/50/60 Hz
C	With stroke control motor 0-20 mA 115 V/60 Hz
D	With stroke control motor 4-20 mA 115 V/60 Hz

Hydraulic oil

0	Standard
1	Food products grade
2	Low temperature to -25 °C

* PVT max. 25 bar

3.4 Hydro Hydraulic Diaphragm Metering Pumps

3.4.4 Spare Parts Kits

The spare parts kits generally include liquid end consumables.

Supplied as standard for SST/HCT stainless steel material version

1 metering diaphragm
2 valve balls
1 seal set

Supplied as standard for PVT material version

1 metering diaphragm
1 suction connector set
1 discharge connector set
2 valve balls
1 seal set

Spare parts kits Hydro/ 2

Applies to identcode: Type 100010, 100009, 100007, 100006, 100003, 064025, 064022, 064018, 064015, 064007

Delivery unit	Materials in contact with medium	Order no.
FMH 25 - DN 10	PVT	1005548
	SST	1005549
	HCT	1009571
	SST (with valve set)	1005550
	SST (for double ball valves)	1005551

Applies to identcode: Type 025068, 025060, 025048, 025040, 025019

Delivery unit	Materials in contact with medium	Order no.
FMH 60 - DN 10	PVT	1005552
	SST	1005553
	HCT	1009573
	SST (with valve set)	1005554
	SST (for double ball valves)	1005555

Spare parts kits Hydro/ 3

Applies to identcode: Type 100035, 100031, 100025, 100021, 100010, 064068, 064060, 064048, 064040, 064019

Delivery unit	Materials in contact with medium	Order no.
FMH 60 - DN 10	PVT	1005552
	SST	1005553
	HCT	1009573
	SST (with valve set)	1005554
	SST (for double ball valves)	1005555

Applies to identcode: Type 025170, 025150, 025120, 025100, 025048

Delivery unit	Materials in contact with medium	Order no.
FMH 150 - DN 15	PVT	1005556
	SST	1005557
	HCT	1009575
	SST (with valve set)	1005558

3.4 Hydro Hydraulic Diaphragm Metering Pumps

Hydro/ 2 PTFE dosing diaphragms / 1.4404

Delivery unit	Order no.
FMH 25 applies to identcode (SST): 100010, 100009, 100007, 100006, 100003, 064025, 064022, 064018, 064015, 064007	1005545
FMH 60 applies to identcode (SST): 026068, 025060, 025048, 025040, 025019	1005546

Hydro/ 2 Pump diaphragms PTFE/Hast. C coated

Delivery unit	Order no.
FMH 25 Applies to identcode (PVT/HCT): 064025, 064022, 064018, 064015, 064007	1006481
FMH 60 Applies to identcode: 025068, 025060, 025048, 025040, 025019	1006482

Hydro/ 3 pump diaphragm PTFE/1.4404

Delivery unit	Order no.
FMH 60 Applies to identcode (SST): 064068, 064060, 064048, 064040, 064019, 100035, 100031, 100025, 100021, 100010	1005546
FMH 150 Applies to identcode (SST): 025170, 025150, 025120, 025100, 025048	1005547

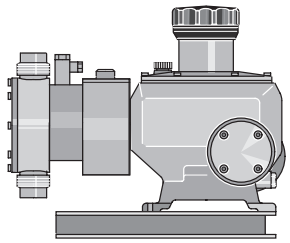
Hydro/ 3 pump diaphragm PTFE/Hastelloy C coated

Delivery unit	Order no.
FMH 60 Applies to identcode (PVT/HCT): 064068, 064060, 064048, 064040, 064019	1006482
FMH 150 Applies to identcode (PVT/HCT): 025170, 025150, 025120, 025100, 025048	1006483

3.4 Hydro Hydraulic Diaphragm Metering Pumps

3.5 Makro TZ Hydraulic Diaphragm Metering Pumps

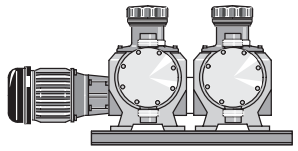
3.5.1 Makro Hydraulic Diaphragm Metering Pumps



pk_2_021

The Makro TZ is fitted as standard with a 230/400 V dual-wound three phase motor, 50/60 Hz, 1.5 kW, enclosure rating IP 55, insulation class F. The stroke length is 20 mm and can be adjusted with 0.5 % precision. The worm gear and shift ring mechanisms, in a choice of 5 reduction ratios, are built into a salt water-resistant and acrylic resin coated cast housing. Liquid ends are available in different material combinations to suit different metering applications (see table). The suction lift varies depending upon the density and viscosity of the feed chemical, and connecting pipe work dimensions. Under defined conditions and providing installation is correct, reproducible metering accuracy is better than ±1 % at a stroke length range of between 10 % and 100 %.(You must follow the instructions in the operating instruction manual)

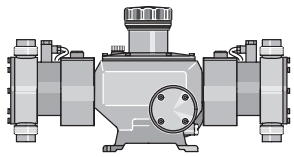
Makro TZ TZHaA Add-On Pumps



pk_2_022

The Makro TZ main diaphragm metering pump can be converted to a duplex or triplex pump with the Makro TZ add-on diaphragm pump (several add-on pumps can be operated at reduced back pressure). Multiplex pumps can also be retrofitted by the operator; all the necessary components and fittings are included with the TZHaA. Different stroke rates can be achieved with the TZ add-on pump independently of the TZ main pump as each TZ add-on pump has its own reducing gear. The main power end can be fitted for this purpose with a more powerful drive motor. A base frame is required when using add-on power ends.

Makro TZ Double Head Version TZHaD/TZHaB

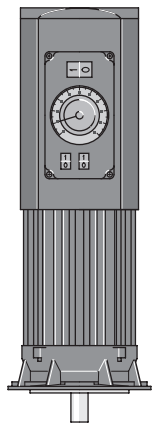


pk_2_023

The double head version of the ProMinent® Makro TZ is similar to the simplex pump. It is, however, fitted with a second liquid end.

The liquid ends work in push-pull mode by means of a coupling element in the gearbox.

Actuation Of Makro TZ Metering Pumps



pk_2_103

Makro TZ stroke length-actuator/stroke controller

Makro TZ stroke actuator

Stroke adjustment motor for automatic stroke length adjustment, adjustment time approx. 1 sec. for 1 % stroke length, fitted with 2 limit switches for min. /max. setting, 1 k Ohm feedback potentiometer; enclosure rating: IP 54. Power supply 230 V (±10 %), 50/60 Hz, 40 W. Mech. stroke length indicator fitted to Makro TZ power end.

Alternative current / higher enclosure rating / Ex-protection to order.

Makro TZ stroke controller

Stroke controller comprising actuator with stroke adjustment motor and integrated microprocessor controller for stroke length adjustment via a standard signal. Technical data see actuator.

Version:

Standard 0/4-20 mA current input, corresponds to 0-100 % stroke length. Change over switch for manual/automatic mode. Key switch for stroke adjustment in manual operating mode. 0/4-20 mA actual value output for remote display.

Variable speed motors with integrated frequency converter (Identcode characteristic V)

Power supply 1 ph 230 V, 50/60 Hz, 2.2 kW.

Optional 0/4-20 mA external control. (see Fig. pk_2_103)

(Speed Controllers see p. → 2-50)

Speed controllers in metal housing (Identcode characteristic Z)

The speed controller kit comprises a frequency converter in a separate metal housing and 2.2 kW variable speed motor.

(Speed Controllers see p. → 2-50)

3.5 Makro TZ Hydraulic Diaphragm Metering Pumps

3.5.2 Identcode Ordering System

Makro TZ 20 hydraulic diaphragm pump

TZHa	Drive type														
	H	Main drive													
	A	Add-on drive													
	D	Double main drive													
	B	Double add-on drive													
		Type*													
		160300	100502												
		160400	100669												
		160500	100836												
		160600	101004												
		160750	101204												
			Material Liquid end												
			PC	PVC											
			PP	Polypropylene											
			SS	Stainless steel											
			TT	PTFE + 25% carbon											
				Seals/diaphragm material											
				T	PTFE										
					Displacement body										
					T	PTFE coating composit diaphragm, with rupture indicator									
						Liquid end version									
						0	No valve springs								
						1	With valve springs								
							Hydraulic connection								
							0	Standard connection							
							1	PVC union nut and insert							
							2	PPP union nut and insert							
							3	PVDF union nut and insert							
							4	SS union nut and insert							
								Version							
								0	with ProMinent® logo, no frame						
								2	no ProMinent® logo, no frame						
								A	with ProMinent® logo, with frame, simplex						
								B	with ProMinent® logo, with frame, duplex						
								C	with ProMinent® logo, with frame, triplex						
								M	Modified						
									Electrical power supply						
									S	3 ph. 230/400 V 50/60 Hz (WBS)					
									P	3 ph. 230/400 V 60 Hz (Exe, Exd)					
									L	3 ph. 230/400 V 50 Hz (Exe, Exd)					
									R	Variable speed motor 4 pole 230/400 V					
									V (0)	Variable speed motor with integr. frequency converter					
									V (2)	With integrated frequency converter (Exd)					
									Z	1 ph, variable speed control set 1 ph, 230 V, 50/60 Hz					
									4	No motor, with 56 C flange					
									7	No motor, with 120/80 flange					
									8	No motor, with 160/90 flange					
									0	Externally mounted drive					
										Enclosure rating					
										0	IP 55 (Standard) ISO class F				
										1	Exe version ATEX-T3				
										2	Exde version ATEX-T4				
										A	ATEX power end				
											Stroke sensor				
											0	No stroke sensor			
											1	With stroke sensor (Namur)			
												Stroke length adjustment			
												0	Stroke length adjustment, man.		
												1	230 V stroke actuator		
												2	115 V stroke actuator		
												3	230 V 0-20 mA stroke controller		
												4	230 V 4-20 mA stroke controller		
												5	115 V 0-20 mA stroke controller		
												6	115 V 4-20 mA stroke controller		
													Application		
													0	Standard	
													3	Low temperature to -25 °C	

* material version PCT/PPT/TTT max. 10 bar

3.5 Makro TZ Hydraulic Diaphragm Metering Pumps

Technical data

Type TZHa	With motor 1500 rpm at 50 Hz				With motor 1800 rpm at 60 Hz			Suction head	Connection, intake/ pressure side	Shipping weight	Hydraulic piston Ø
	Delivery rate at max. backpressure			Max. stroke rate	Delivery rate at max. backpressure		Max. stroke rate				
	bar	l/h	ml/ stroke	Strokes/ min	psi	l/h / gph	Strokes/ min	mWC	G–DN	kg	mm
160300	16	300	69.4	72	232	424.0/112.0	86	3.0	G 1 1/2–25	80*	70
160400	16	400	69.4	96	232	480.0/126.8	115	3.0	G 1 1/2–25	80*	70
160500	16	500	69.4	120	232	600.0/158.5	144	3.0	G 1 1/2–25	80*	70
160600	16	600	69.4	144	232	720.0/190.2	173	3.0	G 1 1/2–25	80*	70
160750	16	750	69.4	180	232			3.0	G 1 1/2–25	80*	70
100502	10	502	116.2	72	145	602.0/159.0	86	3.0	G 2 1/4–40	81*	90
100669	10	669	116.2	96	145	802.0/211.9	115	3.0	G 2 1/4–40	81*	90
100836	10	836	116.2	120	145	1,003.0/265.0	144	3.0	G 2 1/4–40	81*	90
101004	10	1,004	116.2	144	145	1,204.0/318.1	173	3.0	G 2 1/4–40	81*	90
101204	10	1,204	116.2	180	145			3.0	G 2 1/4–40	81*	90

Custom designs to order.

The permissible admission pressure on the suction side is approx. 50 % of max. permissible back pressure.

Material version PPT/PCT/TTT max. 10 bar.

*** Stainless steel version 95 kg.**

Materials In Contact With Chemicals

			DN 25 Ball Valves			DN 40 Plate Valves**		
	Dosing Head	Suction/Discharge Connector	Seals	Valve Balls	Valve Seat	Seals	Valve Plate/ Valve Spring	Valve Seat
PPT	Polypropylene	PVDF	PTFE	Borosilicate glass	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
PCT	PVC	PVDF	PTFE	Borosilicate glass	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
TTT	PTFE with carbon	PVDF	PTFE	Ceramic	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
SST	Stainless steel no. 1.4571/1.4404	Stainless steel no. 1.4581	PTFE	Stainless steel no. 1.4401	PTFE	PTFE	Stainless steel 1.4404/ Hast. C	PTFE

Patented composite diaphragm, vacuum-packed.

** The valve spring is coated with CTFE (similar to PTFE).
Custom versions to order.

Motor Data

Identcode characteristic		Power supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	1.5 kW	
		250-280 V/440-480 V	60 Hz	1.5 kW	
L1	3 ph, II2GEExeIIT3	220-240 V/380-420 V	50 Hz	1.5 kW	
L2	3 ph, II2GEExdIICT4	220-240 V/380-420 V	50 Hz	1.5 kW	with PTC thermistor, speed adjustment range 1:5
P1	3 ph, II2GEExeIIT3	250-280 V/440-480 V	60 Hz	1.5 kW	
P2	3 ph, II2GEExdIICT4	250-280 V/440-480 V	60 Hz	1.5 kW	with PTC thermistor, speed adjustment range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	2.2 kW	with PTC thermistor, speed adjustment range 1:20 with external fan 1 ph 230 V; 50/60 Hz
V0	3 ph, IP 55	400 V ±10 %	50/60 Hz	2.2 kW	variable-speed motor with integrated frequency converter
V2	3 ph, II2GEExdIICT4	400 V ±10 %	50/60 Hz	2.2 kW	Ex variable-speed motor with integrated frequency converter

For further information you can request motor data sheets.

Notice for use in Ex-zone:

After 01.07.2003, only pumps with the corresponding EC-Ex-RL 07/2003 code can be used in explosion-threatened operating areas. The explosion group, category and enclosure rating indicated in the identification shall comply with or exceed the conditions in the intended place of use.

3.5 Makro TZ Hydraulic Diaphragm Metering Pumps

3.5.3 Spare Parts Kits

Spare parts kits Makro TZ (TZHa)

The spare parts kits generally includes liquid end consumables.

1 dosing diaphragm
1 suction valve set
1 discharge valve set
2 valve balls (DN 40 with plate and Hast. C springs)
1 seal set (O rings, valve seat, valve seat housings)

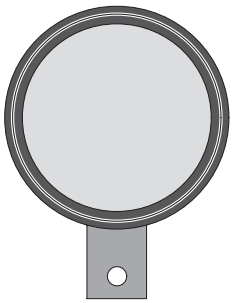
Identcode: 160300, 160400, 160500, 160600, 160750

Delivery unit	Materials in contact with medium	Order no.
FMH 70 - 20	PPT	911903
	PCT	911901
	TTT	911905
	SST	911908
	SST (no valve cpl.)	911907

Identcode: 100502, 100669, 100836, 10100, 101204

Delivery unit	Materials in contact with medium	Order no.
FMH 90 - 20	PPT	911904
	PCT	911902
	TTT	911906
	SST	911910
	SST (no valve cpl.)	911909

Makro TZ 20 (TZHa) dosing diaphragms



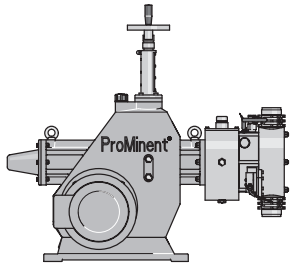
pk_2_024

for FMH 70-20; 90-20

	Order no.
metering diaphragm, patented composite dosing diaphragm, vacuum packed	806938

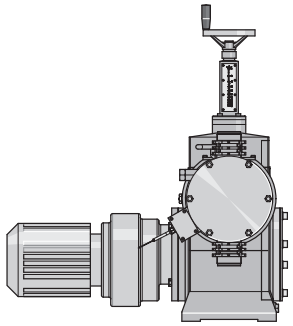
3.6 Makro/ 5 Hydraulic Diaphragm Metering Pumps

3.6.1 Makro/ 5 Hydraulic Diaphragm Metering Pumps



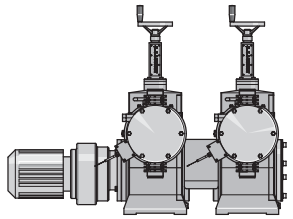
pk_2_096

The Makro/ 5 HMH is driven as standard by a 3 kW spur wheel geared motor, 230/400 V, 50/60 Hz, enclosure rating IP 55, insulation class F. The stroke length can be adjusted between 0…50 mm. The gearbox is encased in a seawater resistant acrylic resin lacquered cast housing. The diaphragm liquid ends are available in different material combinations which are suited to different applications (see table). The metering reproducibility under defined conditions and if installed correctly is better than ±1 % in the stroke length range between 10-100 % (you must read notes in the operating instructions). The priming lift varies with the density and viscosity of the chemical, the connection pipework and the stroking rate of the pump. For technical safety reasons, appropriate equipment must be installed to prevent current overload (you must read the notes in the operating instructions).


pk_2_097

Makro/ 5 Add-On Pumps M5Ha A

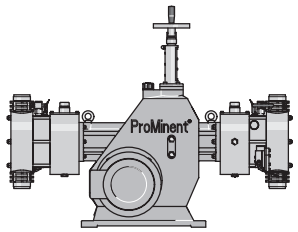
The ProMinent® Makro/ 5 add on pump can be connected to the Makro/ 5 main power end to form a duplex or triplex pump. (At reduced back pressure, up to four add on power ends can be combined with a main power end). Add on power ends can be fitted on site. If required, the main drive can be fitted with a 3 kW and/or 5.5 kW motor. You will require a base frame when connecting add on power ends.


pk_2_094

Makro/ 5 Double Head Version M5HaD (Main Pump) /M5HaB (Add-On Pump)

Essentially the same instructions apply for the Makro/ 5 HMHD and AMHD pumps as for single pumps. They are, however, fitted with a second liquid end.

The liquid ends operate in counter-cycle.



pk_2_092

Makro/ 5 Pump Control

Makro/ 5 stroke length actuator

Servomotor for automatic stroke length adjustment, adjusting time approx. 100 sec. for 100 % stroke length, fitted with 2 limit switches for min./max. settings. Feedback potentiometer 1 k Ohm; enclosure rating: IP 54. Power supply 230 V (± 10%), 50/60 Hz, approx. 40 W, mech. stroke rating display on Makro/ 5 power end.

Custom voltage ratings/higher enclosure ratings/Ex-proof available on request.

Makro/ 5 stroke length controller

Controller comprising actuator with servomotor and integrated microprocessor controller for stroke length adjustment via standard signal. Technical data, see actuator.

Includes:

Standard signal input 0/4-20 mA, (corresponds to stroke length 0-100 %); internal switch for manual/automatic operation, key switch for stroke length adjustment in manual operating mode, actual value output 0/4-20 mA for remote display.

Frequency control for speed controller, enclosure rating IP 55

Frequency inverter encased in safety housing, IP 55, with integrated controller and main switch for the stated motor output.

Optional external control via 0/4-20 mA and/or 0-10 V corresponds to 0-50 (60) Hz output frequency.

Integrated controller with versatile functions including switching between external/internal control. In the case of internal control, frequency input via arrow keys, multi-lingual fault message display etc.

With evaluation equipment for motor temperature monitoring (thermistor protection).

Stroke sensor namur signal

Mounted onto the crank drive of the Makro/ 5 gearbox. For precise detection of each metering stroke, comprising trip cam and inductive proximity switch, Namur-type switch signal. Suitable for batch metering in conjunction with electronic timers and/or for proportional metering in conjunction with proportional controller.

Retrofitting on factory premises only.

Permitted for ex-proof operation with enclosure rating EEx ia II C T6.

3.6 Makro/ 5 Hydraulic Diaphragm Metering Pumps

Technical data

Type M5HaH	With motor 1500 rpm at 50 Hz				With motor 1800 rpm at 60 Hz				Suction head	Connection suction/ discharge side	Shipping weight	Hydraulic piston Ø
	Delivery rate at max. backpressure			Max. stroke rate	Delivery rate at max. backpressure			Max. stroke rate				
	bar	l/h	ml/ stroke	Strokes/ min	psi	l/h	gph	Strokes/ min	mWC	G–DN	kg	mm
250450	25	450	125.0	60	362	537	142	72	3.0	G 2–32	320	60
250562	25	562	125.0	75	362	671	177	89	3.0	G 2–32	320	60
250772	25	772	125.0	103	362	922	244	123	3.0	G 2–32	320	60
250997	25	997	125.0	133	362	1,191	315	159	3.0	G 2–32	320	60
251170	25	1,170	125.0	156						G 2–32	320	60
160616	16	616	171.2	60	145	736	194	72	3.0	G 2 1/4–40	320	70
160770	16	770	171.2	75	145	920	243	89	3.0	G 2 1/4–40	320	70
161058	16	1,058	171.2	103	145	1,264	334	123	3.0	G 2 1/4–40	320	70
161366	16	1,366	171.2	133	145	1,633	431	159	3.0	G 2 1/4–40	320	70
161602	16	1,602	171.2	156					3.0	G 2 1/4–40	320	70
120716	12	716	199.0	60	145	855	226	72	3.0	G 2 1/4–40	320	75
120895	12	895	199.0	75	145	1,069	282	89	3.0	G 2 1/4–40	320	75
121229	12	1,229	199.0	103	145	1,469	388	123	3.0	G 2 1/4–40	320	75
121588	12	1,588	199.0	133	145	1,898	501	159	3.0	G 2 1/4–40	320	75
121862	12	1,862	199.0	156					3.0	G 2 1/4–40	320	75
120919	12	919	255.3	60	145	1,098	290	72	3.0	G 2 1/4–40	320	85
121148	12	1,148	255.3	75	145	1,372	362	89	3.0	G 2 1/4–40	320	85
121577	12	1,577	255.3	103	145	1,885	498	123	3.0	G 2 1/4–40	320	85
122037	12	2,037	255.3	133	145	2,435	643	159	3.0	G 2 1/4–40	320	85
122389	12	2,389	255.3	156		2,856	754		3.0	G 2 1/4–40	320	85
101345	10	1,345	374.0	60	145	1,607	425	72	3.0	G 2 3/4–50	330	100
101680	10	1,680	374.0	75	145	2,008	530	89	3.0	G 2 3/4–50	330	100
102310	10	2,310	374.0	103	145	2,761	729	123	3.0	G 2 3/4–50	330	100
102980	10	2,980	374.0	133	145	3,562	941	159	3.0	G 2 3/4–50	330	100
103500	10	3,500	374.0	156					3.0	G 2 3/4–50	330	100
062305	6	2,305	641.0	60	87	2,755	728	72	3.0	Flange–65*	330	130
062880	6	2,880	641.0	75	87	3,443	910	89	3.0	Flange–65*	330	130
063960	6	3,960	641.0	103	87	4,734	1,251	123	3.0	Flange–65*	330	130
065110	6	5,110	641.0	133	87	6,108	1,614	159	3.0	Flange–65*	330	130
066000	6	6,000	641.0	156					3.0	Flange–65*	330	130

Material Version PPT/PCT/TTT max. 10 bar

* SST version with G 2 1/2“ thread

Materials In Contact With Chemicals

			Plate Valves DN 32; DN 50; DN 65			Plate Valves DN 40 **		
	Dosing Head	Suction/Discharge Connector	Seals	Valve plates/Valve spring	Valve Seat	Seals	Valve plates/Valve spring	Valve Seat
PPT	Polypropylene	Polypropylene	PTFE	Ceramic/ Hast. C + CTFE**	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
PCT	PVC	PVC	PTFE	Ceramic/ Hast. C + CTFE**	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
TTT	PTFE with carbon	PTFE with carbon	PTFE	Ceramic/ Hast. C + CTFE**	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
SST	Stainless steel no. 1.4571/ 1.4404	Stainless steel no. 1.4571/1.4404	PTFE	Stainless steel 1.4404/ Hast. C	PTFE	PTFE	Stainless steel 1.4404/ Hast. C	PTFE

Patented composite diaphragm, vacuum-packed.
Custom designs to order.

** The valve spring is coated with CTFE (Similar to PTFE).

3.6 Makro/ 5 Hydraulic Diaphragm Metering Pumps

3.6.2 Identcode Ordering System

Motor-driven metering pump M5Ha

M5Ha	Drive type											
	H	Main drive										
	A	Add-on power end										
	D	Double main drive										
	B	Double add-on power end										
		Type*										
		250450	160616	120716	120919	101345	062305					
		250562	160770	120895	121148	101680	062880					
		250772	161058	121229	121577	102310	063960					
		250997	161366	121588	122037	102980	065110					
		251170	161602	121862	122389	103500	066000					
			Material: Liquid end									
			PC	PVC								
			PP	Polypropylene								
			SS	Stainless steel								
			TT	PTFE + 25 % carbon								
				Seals/diaphragm material								
				T	PTFE							
					Displacement body							
					T	Composite diaphragm, PTFE coating, with rupture indicator						
						Liquid end version						
						1	With valve springs					
							Hydraulic connection					
							0	Standard connection				
							1	PVC union nut and insert				
							2	PPP union nut and insert				
							3	PVDF union nut and insert				
							4	SS union nut and insert				
								Version				
								0	with ProMinent® logo, no frame			
								1	without ProMinent® logo, no frame			
								A	with ProMinent® logo, with frame, simplex			
								B	with ProMinent® logo, with frame, duplex			
								C	with ProMinent® logo, with frame, triplex			
								D	with ProMinent® logo, with frame, quadruplex			
								M	Modified			
									Electrical power supply			
									S	3 ph. 230/400 V 50/60 Hz (WBS)		
									P	3 ph. 230/400 V 60 Hz (Exe, Exde)		
									L	3 ph. 230/400 V 50 Hz (Exe, Exde)		
									R	Variable speed motor 4 pole230/400 V		
									V (0)	Motor with integr. frequency converter		
									V (2)	Motor with integr. frequency converter (Exde)		
									5	No motor, with gearbox IEC 100		
									6	No motor, with gearbox IEC 112		
									0	No motor, no gearbox		
										Enclosure rating		
										0	IP 55 (Standard) ISO class F	
										1	Exe version ATEX-T3	
										2	Exde version ATEX-T4	
										A	ATEX power end	
											Stroke sensor	
											0	No stroke sensor
											1	With stroke sensor (Namur)
												Stroke length adjustment
												0 Stroke length adjustment, man.
												3 230 V 0-20 mA stroke controller
												4 230 V 4-20 mA stroke controller
												5 115 V 0-20 mA stroke controller
												6 115 V 4-20 mA stroke controller
												Application
												0 Standard
												3 Low temperature to -25 °C

* material version PC/PP/TT max. 10 bar

3.6 Makro/ 5 Hydraulic Diaphragm Metering Pumps

3.6.3 Spare Parts Kits

Spare parts kits Makro/ 5 HMH

The spare parts kits generally contain the consumable components for the liquid ends.

1 dosing diaphragm
1 suction valve set
1 discharge valve set
1 seal set (O-rings, packing rings, valve seat, valve seat housings)

Identcode: 250450, 250562, 250772, 250997, 251170

Delivery unit	Materials in contact with medium	Order no.
Liquid end FMH 60-50	S (with 2 additional valve assemblies)	1008170
	S (no valve set)	1008169

Identcode: 160616, 160770, 161058, 161366, 161602, 120716, 120895, 121229, 121588, 121862, 120919, 121148, 121577, 122037, 122389

Delivery unit	Materials in contact with medium	Order no.
Liquid end FMH 70/75/85-50	PPT	911904
	PCT	911902
	TTT	911906
	SST	911910
	SST (no valve cpl.)	911909

Identcode: 101345, 101680, 102310, 102980, 103500

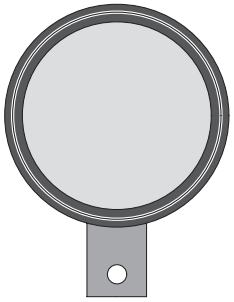
Delivery unit	Materials in contact with medium	Order no.
Liquid end FMH 100-50	PP	1008246
	P	1008247
	T	1008248
	S (with valve set)	1008250
	S (no valve set)	1008249

Identcode: 062305, 062880, 063960, 065110, 066000

Delivery unit	Materials in contact with medium	Order no.
Liquid end FMH 130-50	PP	1008251
	P	1008252
	T	1008253
	S (with valve set)	1008265
	S (no valve set)	1008264

Makro/ 5 HMH dosing diaphragms

patented composite diaphragm, vacuum packed



pk_2_024

Delivery unit	Order no.
FMH 60/70/75/85–50	1007298
FMH 100/130–50	1007852

3.6 Makro/ 5 Hydraulic Diaphragm Metering Pumps

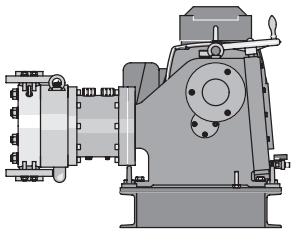
Motor Data

Identcode characteristic		Power supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	3 kW	
		250-280 V/440-480 V	60 Hz	3 kW	
L1	3 ph, II2GEExellT3	220-240 V/380-420 V	50 Hz	3.6 kW	
L2	3 ph, II2GEExdIICT4	220-240 V/380-420 V	50 Hz	4 kW	with PTC thermistor, speed adjustment range 1:5
P1	3 ph, II2GEExellT3	250-280 V/440-480 V	60 Hz	3.6 kW	
P2	3 ph, II2GEExdIICT4	250-280 V/440-480 V	60 Hz	4 kW	with PTC thermistor, speed adjustment range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	3 kW	with PTC thermistor, speed adjustment range 1:5
V0	3 ph, IP 55	400 V ±10 %	50/60 Hz	3 kW	variable speed motor with integrated frequency converter
V2	3 ph, II2GEExellCT4	400 V ±10 %	50/60 Hz	4 kW	Ex variable-speed motor with integrated frequency converter

Notice for use in Ex-zone:
After 01.07.2003, only pumps with the corresponding EC-Ex-RL 94/9 code can be used in explosion-threatened operating areas. The explosion group, category and enclosure rating indicated in the identification shall comply with or exceed the conditions in the intended place of use.

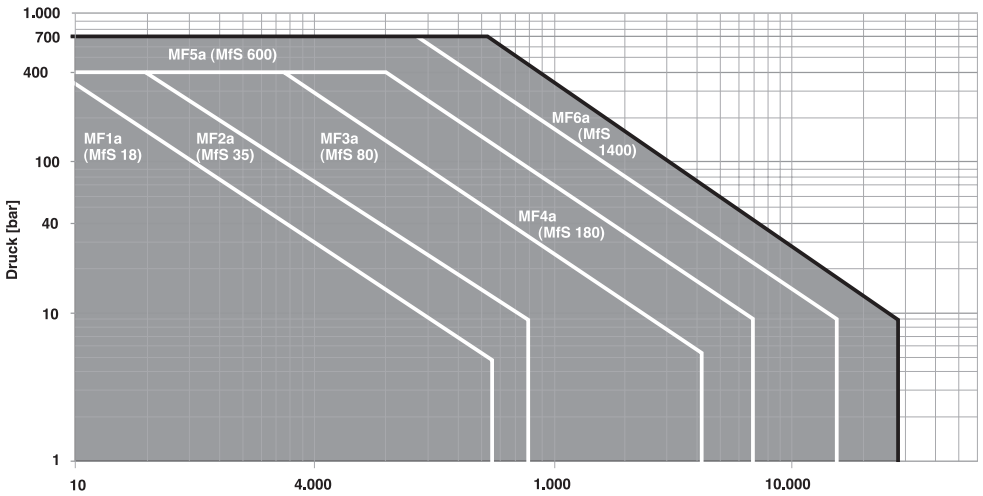
3.7 ORLITA® MF Hydraulic Diaphragm Metering Pumps

3.7.1 ORLITA® MF Hydraulic Diaphragm Pump



pk_2_121
MfS 600-75

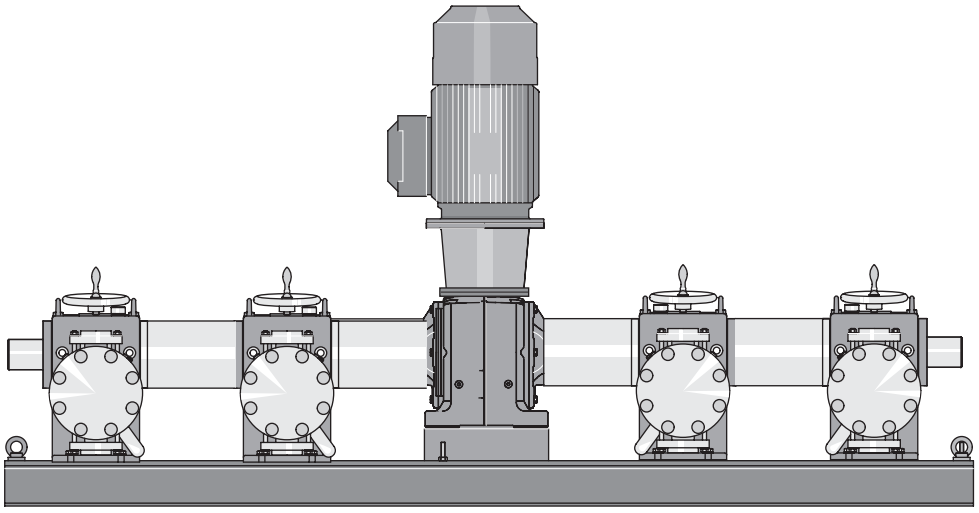
Dosing pumps in the ORLITA® MF product range are modular in construction and basically comprise drive mechanism, crank and liquid end as separate functional groups. The hydraulic diaphragm liquid end is equipped with a PTFE dual membrane system with integrated rupture indicator. An integrated pressure relief valve protects the pump from overload. Reproducible metering accuracy under defined conditions and adjusted installation is ±0.5% in the 10-100% stroke length adjustment range.



Pressure [bar] as a function of metered quantity [l/h] at 50 Hz

Multiplexed Metering Pumps

The ORLITA® MF range's modular construction enables variable combination of drives, motors and dosing heads e.g. quadruple MF dosing pumps with central drive.

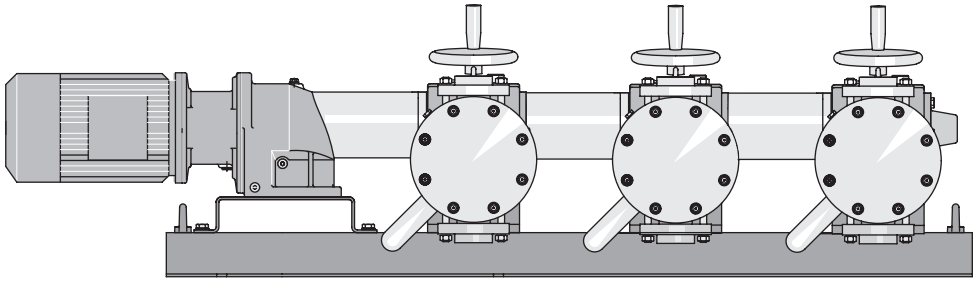


Orlita multiplexed pump

pk_2_128

Triplex Metering Pumps

In triplex dosing pumps, the pressure stroke of each dosing head occurs through 120° of crank travel. This results in a dosing flow free of pulsation without the use of elaborate pulsation dampers. This design of process diaphragm pump is preferred equipment in the chemical and petrochemical industries.

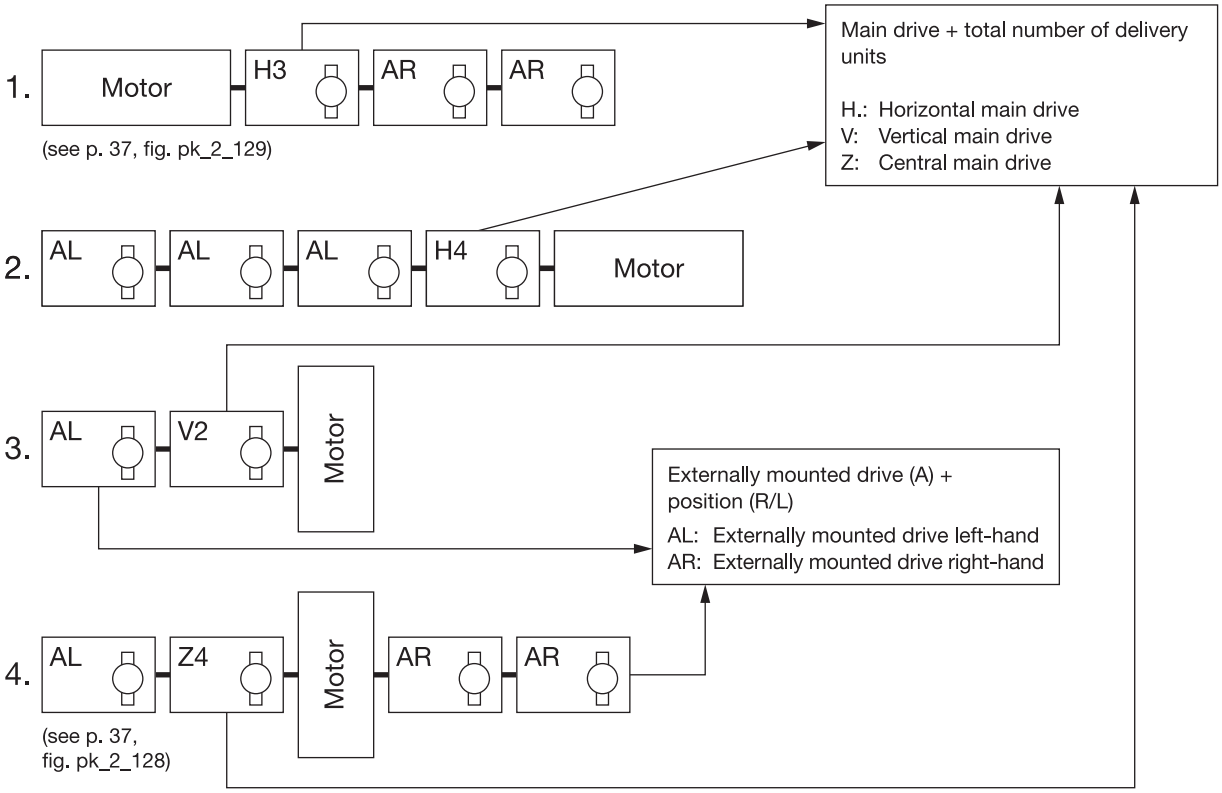


Orlita triplex pump

pk_2_129

3.7 ORLITA® MF Hydraulic Diaphragm Metering Pumps

Type Of Drive



When ordering a multiplexed pump, the main and/or all externally mounted pumps require a separate Identcode.

For example a triplex pumpe (1.) : MF_aH3.....
MF_aAR.....
MF_aAR.....

Materials In Contact With Chemicals

	Liquid end	Vacuum and pressure valve housing	Valve seals	Valve	Valve seat	Range
S1 (DIN)	1.4404		1.4571	Rubin	1.4571	DN 3
S1 (ANSI)	A 316 L	N/A	A 316 Ti	Ruby	A 316 Ti	
S1 (DIN)	1.4404	1.4404	1.4571	1.4462	1.4462	≥= DN6
S1 (ANSI)	A 316 L	A 316 L	A 316 Ti	Duplex SS	Duplex SS	
S2 (DIN)	1.4462	1.4462	1.4571	1.4462	1.4462	≥= DN6
S2 (ANSI)	Duplex SS	Duplex SS	A 316 Ti	Duplex SS	Duplex SS	
S3 (DIN)	1.4539	1.4539	2.4610	1.4539	1.4539	≥= DN6
S3 (ANSI)	A904L	A904L	Hastelloy C-4	A904L	A904L	

Motor Data

A	50 Hz	3 ph. 230/400	3 ph. 500	3 ph. 380/660
		3 ph. 400/690	3 ph. 415	
B (adjustable 1:5)	50 Hz	3 ph. 230/400	3 ph. 500	3 ph. 380/660
		3 ph. 400/690	3 ph. 415	
H	60 Hz	3 ph. 220/380	3 ph. 400	
K (adjustable 1:5)	60 Hz	3 ph. 220/380	3 ph. 400	

3.7 ORLITA® MF Hydraulic Diaphragm Metering Pumps

3.7.2 ORLITA® MfS 18 (MF1a) Hydraulic Diaphragm Pump

Technical Data MfS 18 Single Pump 50 Hz

Plunger Ø	Stroke volume	Pump capacity Q_{th} in l/h per head at stroke rate n in 1/min Identcode specification: [3 to 7]					Max. pressure p	Efficiency WG at		Standard type of valve	Standardconnection Suction/ Discharge side	
		70	88	108	140	200		100%	50%			
mm	cm³/ stroke	[3]	[4]	[5]	[6]	[7]	bar	Pressure	PRessure		DIN/ISO	ANSI/SME
7	0.58	2.4	3.0	3.7	4.8	6.9	400.0	0.50	0.70	DKu* DN 3	G1/4 internal	1/4" FNPT
8	0.75	3.2	4.0	4.9	6.3	9.0	348.0	0.55	0.72	DKu* DN 3	G1/4 internal	1/4" FNPT
10	1.18	4.9	6.2	7.6	9.9	14.1	222.0	0.67	0.79	Ke*** DN 6	G3/8 internal	1/4" FNPT
12	1.70	7.1	9.0	11.0	14.3	20.4	154.0	0.84	0.88	Ke*** DN 6	G3/8 internal	1/4" FNPT
16	3.02	12.7	15.9	19.5	25.3	36.2	87.0	0.86	0.88	Ke*** DN 6	G3/8 internal	1/4" FNPT
20	4.71	19.8	24.9	30.5	39.6	56.5	55.0	0.88	0.89	Ke*** DN 6	G3/8 internal	1/4" FNPT
22	5.70	23.9	30.1	36.9	47.9	68.4	46.0	0.88	0.89	Ke*** DN 10/ DN 6	G3/8 internal	1/2"x1/4" FNPT
25	7.36	30.9	38.9	47.7	61.9	88.4	35.0	0.89	0.89	Ke*** DN 10	G3/8 internal	1/2" FNPT
27	8.59	36.1	45.3	55.7	72.1	103.1	30.0	0.89	0.89	Ke*** DN 10	G3/8 internal	1/2" FNPT
30	10.60	44.5	56.0	68.7	89.1	127.2	24.0	0.89	0.89	Ke*** DN 10	DN 10 PN 40	1/2" #300RF
36	15.27	64.1	80.6	98.9	128.3	183.2	17.0	0.89	0.89	Ke*** DN 16	DN 15 PN 40	3/4" #150RF
40	18.85	79.2	99.5	122.1	158.3	226.2	13.0	0.89	0.89	Ke*** DN 16	DN 15 PN 40	3/4" #150RF
44	22.81	95.8	120.4	147.8	191.6	273.7	11.0	0.89	0.90	Ke*** DN 16	DN 15 PN 40	3/4" #150RF
50	29.45	123.7	155.5	190.9	247.4	353.4	8.0	0.89	0.90	Ke*** DN 16	DN 15 PN 40	3/4" #150RF
65	49.77	209.1	262.8	322.5	418.1	597.3	5.0	0.90	0.90	Ke*** DN 16/ DN 25	DN 15/25 PN 40	3/4"x1" #150RF

Technical Data MfS 18 Single Pump 60 Hz

Plunger Ø	Stroke volume	Pump capacity Q_{th} in l/h per head at stroke rate n in 1/min Identcode specification: [2 to 6]					Max. pressure p	Efficiency WG at		Standard type of valve	Standardconnection Suction/ Discharge side	
		67	87	106	130	168		100%	50%			
mm	cm³/ stroke	[2]	[3]	[4]	[5]	[6]	bar	Pressure	Pressure		DIN/ISO	ANSI/SME
7	0.58	2.3	3.0	3.7	4.5	5.8	400.0	0.50	0.70	DKu* DN 3	G1/4 internal	1/4" FNPT
8	0.75	3.0	3.9	4.8	5.9	7.6	348.0	0.55	0.72	DKu* DN 3	G1/4 internal	1/4" FNPT
10	1.18	4.7	6.1	7.5	9.2	11.9	222.0	0.67	0.79	Ke*** DN 6	G3/8 internal	1/4" FNPT
12	1.70	6.8	8.9	10.8	13.2	17.1	154.0	0.84	0.88	Ke*** DN 6	G3/8 internal	1/4" FNPT
16	3.02	12.1	15.7	19.2	23.5	30.4	87.0	0.86	0.88	Ke*** DN 6	G3/8 internal	1/4" FNPT
20	4.71	18.9	24.6	30.0	36.8	47.5	55.0	0.88	0.89	Ke*** DN 6	G3/8 internal	1/4" FNPT
22	5.70	22.9	29.8	36.3	44.5	57.5	46.0	0.88	0.89	Ke*** DN 10/ DN 6	G3/8 internal	1/2"x1/4" FNPT
25	7.36	29.6	38.4	46.8	57.4	74.2	35.0	0.89	0.89	Ke*** DN 10	G3/8 internal	1/2" FNPT
27	8.59	34.5	44.8	54.6	67.0	86.6	30.0	0.89	0.89	Ke*** DN 10	G3/8 internal	1/2" FNPT
30	10.60	42.6	55.3	67.4	82.7	106.9	24.0	0.89	0.89	Ke*** DN 10	DN 10 PN 40	1/2" #300RF
36	15.27	61.4	79.7	97.1	119.1	153.9	17.0	0.89	0.89	Ke*** DN 16	DN 15 PN 40	3/4" #150RF
40	18.85	75.8	98.4	119.9	147.0	190.0	13.0	0.89	0.89	Ke*** DN 16	DN 15 PN 40	3/4" #150RF
44	22.81	91.7	119.1	145.1	177.9	229.9	11.0	0.89	0.90	Ke*** DN 16	DN 15 PN 40	3/4" #150RF
50	29.45	118.4	153.7	187.3	229.7	296.9	8.0	0.89	0.90	Ke*** DN 16	DN 15 PN 40	3/4" #150RF
65	49.77	200.1	259.8	316.6	388.2	501.7	5.0	0.90	0.90	Ke*** DN 16/ DN 25	DN 15/25 PN 40	3/4"x1" #150RF

* Double ball

*** Cone

Note:
- Further variants on request
- In layouts conforming to API a power reserve of at least 10% must be allowed for
- All hydraulic performance data are based on water at 20 °C

3.7 ORLITA® MF Hydraulic Diaphragm Metering Pumps

Identcode Ordering System

Motor-Driven Metering Pump ORLITA® MfS18 (MF1a)

| MF1a | Drive type | | |

3.7 ORLITA® MF Hydraulic Diaphragm Metering Pumps

3.7.3 ORLITA® MfS 35 (MF2a) Hydraulic Diaphragm Pump

Technical Data MfS 35 Single Pump 50 Hz

Plunger Ø	Stroke volume	Pump capacity Q_{th} in l/h per head at stroke rate n in 1/min Identcode specification: [3 to 7]					Max. pressure p	Efficiency WG at		Standard type of valve	Standardconnection Suction/ Discharge side	
		70	88	108	140	200		100% Pressure	50% Pressure			
mm	cm³/ stroke	[3]	[4]	[5]	[6]	[7]	bar				DIN/ISO	ANSI/SME
7	0.77	3.2	4.1	5.0	6.5	9.2	400.0	0.50	0.70	DKu* DN 3	G1/4 internal	1/4" FNPT
8	1.01	4.2	5.3	6.5	8.4	12.1	400.0	0.50	0.70	DKu* DN 3	G1/4 internal	1/4" FNPT
10	1.57	6.6	8.3	10.2	13.2	18.8	400.0	0.50	0.70	Ke*** DN 6	G3/8 internal	1/4" FNPT
12	2.26	9.5	11.9	14.7	19.0	27.1	309.0	0.79	0.85	Ke*** DN 6	G3/8 internal	1/4" FNPT
16	4.02	16.9	21.2	26.1	33.8	48.3	174.0	0.83	0.86	Ke*** DN 6	G3/8 internal	1/4" FNPT
20	6.28	26.4	33.2	40.7	52.8	75.4	111.0	0.86	0.88	Ke*** DN 6	G3/8 internal	1/4" FNPT
22	7.60	31.9	40.1	49.3	63.9	91.2	92.0	0.86	0.88	Ke*** DN 10/ DN 6	G3/8 internal	1/2"x1/4" FNPT
25	9.82	41.2	51.8	63.6	82.5	117.8	71.0	0.87	0.88	Ke*** DN 10	G3/8 internal	1/2" FNPT
27	11.45	48.1	60.5	74.2	96.2	137.4	61.0	0.87	0.88	Ke*** DN 10	G3/8 internal	1/2" FNPT
30	14.14	59.4	74.6	91.6	118.8	169.6	49.0	0.88	0.89	Ke*** DN 10	DN 10 PN 100	1/2" #300RF
36	20.36	85.5	107.5	131.9	171.0	244.3	34.0	0.88	0.89	Ke*** DN 16	DN 15 PN 40	3/4" #300RF
40	25.13	105.6	132.7	162.9	211.1	301.6	27.0	0.89	0.89	Ke*** DN 16	DN 15 PN 40	3/4" #300RF
44	30.41	127.7	160.6	197.1	255.4	364.9	23.0	0.89	0.89	Ke*** DN 16	DN 15 PN 40	3/4" #300RF
50	39.27	164.9	207.3	254.5	329.9	471.2	17.0	0.89	0.89	Ke*** DN 16	DN 15 PN 40	3/4" #150RF
65	66.37	278.7	350.4	430.1	557.5	796.4	10.0	0.89	0.90	Ke*** DN 16/ DN 25	DN 15/25 PN 40	3/4"x1" #150RF

Technical Data MfS 35 Single Pump 60 Hz

Plunger Ø	Stroke volume	Pump capacity Q_{th} in l/h per head at stroke rate n in 1/min Identcode specification: [2 to 6]					Max. pressure p	Efficiency WG at		Standard type of valve	Standardconnection Suction/ Discharge side	
		67	87	106	130	168		100% Pressure	50% Pressure			
mm	cm³/ stroke	[2]	[3]	[4]	[5]	[6]	bar				DIN/ISO	ANSI/SME
7	0.77	3.1	4.0	4.9	6.0	7.8	400.0	0.50	0.70	DKu* DN 3	G1/4 internal	1/4" FNPT
8	1.01	4.0	5.2	6.4	7.8	10.1	400.0	0.50	0.70	DKu* DN 3	G1/4 internal	1/4" FNPT
10	1.57	6.3	8.2	10.0	12.3	15.8	400.0	0.50	0.70	Ke*** DN 6	G3/8 internal	1/4" FNPT
12	2.26	9.1	11.8	14.4	17.6	22.8	309.0	0.79	0.85	Ke*** DN 6	G3/8 internal	1/4" FNPT
16	4.02	16.2	21.0	25.6	31.4	40.5	174.0	0.83	0.86	Ke*** DN 6	G3/8 internal	1/4" FNPT
20	6.28	25.3	32.8	40.0	49.0	63.3	111.0	0.86	0.88	Ke*** DN 6	G3/8 internal	1/4" FNPT
22	7.60	30.6	39.7	48.4	59.3	76.6	92.0	0.86	0.88	Ke*** DN 10/ DN 6	G3/8 internal	1/2"x1/4" FNPT
25	9.82	39.5	51.2	62.4	76.6	99.0	71.0	0.87	0.88	Ke*** DN 10	G3/8 internal	1/2" FNPT
27	11.45	46.0	59.8	72.8	89.3	115.4	61.0	0.87	0.88	Ke*** DN 10	G3/8 internal	1/2" FNPT
30	14.14	56.8	73.8	89.9	110.3	142.5	49.0	0.88	0.89	Ke*** DN 10	DN 10 PN 100	1/2" #300RF
36	20.36	81.8	106.3	129.5	158.8	205.2	34.0	0.88	0.89	Ke*** DN 16	DN 15 PN 40	3/4" #300RF
40	25.13	101.0	131.2	159.8	196.0	253.3	27.0	0.89	0.89	Ke*** DN 16	DN 15 PN 40	3/4" #300RF
44	30.41	122.3	158.7	193.4	237.2	306.5	23.0	0.89	0.89	Ke*** DN 16	DN 15 PN 40	3/4" #300RF
50	39.27	157.9	205.0	249.8	306.3	395.8	17.0	0.89	0.89	Ke*** DN 16	DN 15 PN 40	3/4" #150RF
65	66.37	266.8	346.4	422.1	517.7	669.0	10.0	0.89	0.90	Ke*** DN 16/ DN25	DN 15/25 PN 40	3/4"x1" #150RF

* Double ball

*** Cone

Note:

- Further variants on request
- In layouts conforming to API a power reserve of at least 10% must be allowed for
- All hydraulic performance data are based on water at 20 °C

3.7 ORLITA® MF Hydraulic Diaphragm Metering Pumps

Identcode Ordering System

Motor-Driven Metering Pump ORLITA® MfS35 (MF2a)

| MF2a | Drive type | | |

3.7 ORLITA® MF Hydraulic Diaphragm Metering Pumps

3.7.4 ORLITA® MfS 80 (MF3a) Hydraulic Diaphragm Pump

Technical Data MfS 80 Single Pump 50 Hz

Plunger Ø	Stroke volume	Pump capacity Q_{th} in l/h per head at stroke rate n in 1/min Identcode specification: [3 to 8]						Max. pressure p	Efficiency WG at		Standard type of valve	Standardconnection Suction/ Discharge side	
		70	90	115	134	152	194		100%	50%			
mm	cm³/ stroke	[3]	[4]	[5]	[6]	[7]	[8]	bar	Pressure	Pressure		DIN/ISO	ANSI/SME
16	4.02	16.9	21.7	27.7	32.3	36.7	46.8	400.0	0.75	0.83	Ke*** DN 6	G 3/8	1/4" FNPT
20	6.28	26.4	33.9	43.4	50.5	57.3	73.1	400.0	0.75	0.83	Ke*** DN 6	G 3/8	1/4" FNPT
22	7.60	31.9	41.1	52.5	61.1	69.3	88.5	360.0	0.79	0.80	Ke*** DN 10/ DN 6	G 3/8	1/2" x 1/4" FNPT
25	9.82	41.2	53.0	67.7	78.9	89.5	114.3	285.0	0.79	0.85	Ke*** DN 10	G 3/8	1/2" FNPT
27	11.45	48.1	61.8	79.0	92.1	104.4	133.3	244.0	0.81	0.85	Ke*** DN 10	G 3/8	1/2" FNPT
30	14.14	59.4	76.3	97.5	113.7	128.9	164.6	198.0	0.83	0.86	Ke*** DN 10	DN 10 PN 250	1/2" 1500RF
36	20.36	85.5	109.9	140.5	163.7	185.7	237.0	137.0	0.85	0.87	Ke*** DN 16	DN 15 PN 160	3/4" 1500RF
40	25.13	105.6	135.7	173.4	202.1	229.2	292.5	111.0	0.86	0.88	Ke*** DN 16	DN 15 PN 160	3/4" 1500RF
44	30.41	127.7	164.2	209.8	244.5	277.3	354.0	98.0	0.86	0.88	Ke*** DN 16	DN 15 PN 100	3/4" 600RF
50	39.27	164.9	212.1	271.0	315.7	358.1	457.1	71.0	0.87	0.88	Ke*** DN 16	DN 15 PN 100	3/4" 600RF
65	66.37	278.7	358.4	457.9	533.6	605.3	772.5	40.0	0.88	0.89	Ke*** DN 16/ DN 25	DN 25 PN 40	1" 300RF
80	100.53	422.2	542.9	693.7	808.3	916.8	1,170.2	25.0	0.89	0.89	Ke*** DN 25	DN 25 PN 40	1" 300RF
100	157.08	659.7	848.2	1,083.8	1,262.9	1,432.6	1,828.4	17.0	0.89	0.89	Ke*** DN 32	DN 32 PN 40	1 1/2" 150RF
120	226.19	950.0	1,221.5	1,560.7	1,818.6	2,062.9		12.0	0.89	0.89	Ke*** DN 32	DN 32 PN 40	1 1/2" 150RF
140	307.88	1,293.1	1,662.5	2,124.3	2,475.3	2,807.8		9.0	0.89	0.90	Ke*** DN 40	DN 40 PN 16	1 1/2" 150RF
150	353.43	1,484.4	1,908.5	2,438.7	2,841.6	3,223.3		7.0	0.89	0.90	Ke*** DN 40	DN 40 PN 16	1 1/2" 150RF

Technical Data MfS 80 Single Pump 60 Hz

Plunger Ø	Stroke volume	Pump capacity Q_{th} in l/h per head at stroke rate n in 1/min Identcode specification: [2 to 7]						Max. pressure p	Efficiency WG at		Standard type of valve	Standardconnection Suction/ Discharge side	
		73	84	120	138	155	182		100%	50%			
mm	cm³/ stroke	[2]	[3]	[4]	[5]	[6]	[7]	bar	Pressure	Pressure		DIN/ISO	ANSI/SME
16	4.02	17.6	20.3	29.0	33.3	37.4	43.9	400.0	0.75	0.83	Ke*** DN 6	G 3/8	1/4" FNPT
20	6.28	27.5	31.7	45.2	52.0	58.4	68.6	400.0	0.75	0.83	Ke*** DN 6	G 3/8	1/4" FNPT
22	7.60	33.3	38.3	54.7	62.9	70.7	83.0	360.0	0.79	0.80	Ke*** DN 10/ DN 6	G 3/8	1/2" x 1/4" FNPT
25	9.82	43.0	49.5	70.7	81.3	91.3	107.2	285.0	0.79	0.85	Ke*** DN 10	G 3/8	1/2" FNPT
27	11.45	50.2	57.7	82.4	94.8	106.5	125.0	244.0	0.81	0.85	Ke*** DN 10	G 3/8	1/2" FNPT
30	14.14	61.9	71.3	101.8	117.1	131.5	154.4	198.0	0.83	0.86	Ke*** DN 10	DN 10 PN 250	1/2" 1500RF
36	20.36	89.2	102.6	146.6	168.6	189.3	222.3	137.0	0.85	0.87	Ke*** DN 16	DN 15 PN 160	3/4" 1500RF
40	25.13	110.1	126.7	181.0	208.1	233.7	274.4	111.0	0.86	0.88	Ke*** DN 16	DN 15 PN 160	3/4" 1500RF
44	30.41	133.2	153.3	219.0	251.8	282.8	332.1	98.0	0.86	0.88	Ke*** DN 16	DN 15 PN 100	3/4" 600RF
50	39.27	172.0	197.9	282.7	325.2	365.2	428.8	71.0	0.87	0.88	Ke*** DN 16	DN 15 PN 100	3/4" 600RF
65	66.37	290.7	334.5	477.8	549.5	617.2	724.7	40.0	0.88	0.89	Ke*** DN 16/ DN 25	DN 25 PN 40	1" 300RF
80	100.53	440.3	506.7	723.8	832.4	934.9	1,097.8	25.0	0.89	0.89	Ke*** DN 25	DN 25 PN 40	1" 300RF
100	157.08	688.0	791.7	1,131.0	1,300.6	1,460.8	1,715.3	17.0	0.89	0.89	Ke*** DN 32	DN 32 PN 40	1 1/2" 150RF
120	226.19	990.7	1,140.0	1,628.6	1,872.9	2,103.6		12.0	0.89	0.89	Ke*** DN 32	DN 32 PN 40	1 1/2" 150RF
140	307.88	1,348.5	1,551.7	2,216.7	2,549.2	2,863.2		9.0	0.89	0.90	Ke*** DN 40	DN 40 PN 16	1 1/2" 150RF
150	353.43	1,548.0	1,781.3	2,544.7	2,926.4	3,286.9		7.0	0.89	0.90	Ke*** DN 40	DN 40 PN 16	1 1/2" 150RF

*** Cone

Note:

- Further variants on request
- In layouts conforming to API a power reserve of at least 10% must be allowed for
- All hydraulic performance data are based on water at 20 °C

3.7 ORLITA® MF Hydraulic Diaphragm Metering Pumps

Identcode Ordering System

Motor-Driven Metering Pump ORLITA® MfS80 (MF3a)

| MF3a | Drive type | | |

3.7 ORLITA® MF Hydraulic Diaphragm Metering Pumps

3.7.5 ORLITA® MfS 180 (MF4a) Hydraulic Diaphragm Pump

Technical Data MfS 180 Single Pump 50 Hz

Plunger Ø	Stroke volume	Pump capacity Q_{th} in l/h per head at stroke rate n in 1/min Identcode specification: [3 to 8]						Max. pressure p	Efficiency WG at		Standard type of valve	Standardconnection Suction/ Discharge side	
		67	88	103	137	154	173		100%	50%			
mm	cm³/ stroke	[3]	[4]	[5]	[6]	[7]	[8]	bar	Pressure	Pressure		DIN/ISO	ANSI/SME
25	19.63	78.9	103.7	121.3	161.4	181.4	203.8	366.0	0.77	0.83	Ke*** DN 16	DN 15 PN 400	3/4" 2500RTJ
30	28.27	113.7	149.3	174.7	232.4	261.3	293.5	254.0	0.81	0.85	Ke*** DN 16	DN 15 PN 320	3/4" 1500RF
36	40.72	163.7	215.0	251.6	334.7	376.2	422.6	176.0	0.83	0.86	Ke*** DN 16	DN 15 PN 250	1" 1500RF
38	45.36	182.4	239.5	280.4	372.9	419.2	470.9	158.0	0.84	0.87	Ke*** DN 16	DN 15 PN 160	1" 1500RF
40	50.27	202.1	265.4	310.6	413.2	464.5	521.8	143.0	0.85	0.87	Ke*** DN 16	DN 15 PN 160	1" 1500RF
44	60.82	244.5	321.1	375.9	500.0	562.0	631.3	118.0	0.85	0.87	Ke*** DN 25	DN 25 PN 160	1" 1500RF
46	66.48	267.2	351.0	410.8	546.4	614.2	690.0	108.0	0.86	0.88	Ke*** DN 25	DN 25 PN 160	1" 1500RF
48	72.38	291.0	382.2	447.3	595.0	668.8	751.3	108.0	0.86	0.88	Ke*** DN 25	DN 25 PN 160	1" 1500RF
50	78.54	315.7	414.7	485.4	645.6	725.7	815.2	91.0	0.86	0.88	Ke*** DN 25	DN 25 PN 100	1" 600RF
55	95.03	382.0	501.8	587.3	781.2	878.1	986.4	75.0	0.87	0.88	Ke*** DN 25	DN 25 PN 100	1" 600RF
60	113.10	454.7	597.2	698.9	929.7	1,045.0	1,174.0	63.0	0.87	0.89	Ke*** DN 25	DN 25 PN 64	1" 600RF
65	132.73	533.6	700.8	820.3	1,091.1	1,226.4	1,377.8	54.0	0.88	0.89	Ke*** DN 32	DN 40 PN 64	1 1/2" 600RF
70	153.94	618.8	812.8	951.3	1,265.4	1,422.4	1,597.9	46.0	0.88	0.89	Ke*** DN 32	DN 40 PN 64	1 1/2" 600RF
75	176.71	710.4	933.1	1,092.1	1,452.6	1,632.8	1,834.3	40.0	0.88	0.89	Ke*** DN 32	DN 40 PN 64	1 1/2" 300RF
80	201.06	808.3	1,061.6	1,242.6	1,652.7	1,857.8	2,087.0	35.0	0.88	0.89	Ke*** DN 40	DN 40 PN 40	1 1/2" 300RF
85	226.98	912.5	1,198.5	1,402.7	1,865.8	2,097.3	2,356.1	31.0	0.88	0.89	Ke*** DN 40	DN 40 PN 40	1 1/2" 300RF
90	254.47	1,023.0	1,343.6	1,572.6	2,091.7	2,351.3	2,641.4	28.0	0.89	0.89	Ke*** DN 40	DN 40 PN 40	1 1/2" 300RF
100	314.16	1,262.9	1,658.8	1,941.5	2,582.4	2,902.8	3,261.0	22.0	0.89	0.89	Ke*** DN 50	DN 50 PN 40	2" 150RF
115	415.48	1,670.2	2,193.7	2,567.6	3,415.2	3,839.0		17.0	0.89	0.89	Ke*** DN 65	DN 65 PN 40	2 1/2" 150RF
135	572.56	2,301.7	3,023.1	3,538.4	4,706.4	5,290.4		12.0	0.89	0.90	Ke*** DN 65	DN 65 PN 16	2 1/2" 150RF

Technical Data MfS 180 Single Pump 60 Hz

Plunger Ø	Stroke volume	Pump capacity Q_{th} in l/h per head at stroke rate n in 1/min Identcode specification: [2 to 7]						Max. pressure p	Efficiency WG at		Standard type of valve	Standardconnection Suction/ Discharge side	
		71	91	106	139	164	184		100%	50%			
mm	cm³/ stroke	[2]	[3]	[4]	[5]	[6]	[7]	bar	Pressure	Pressure		DIN/ISO	ANSI/SME
25	19.63	83.6	107.2	124.9	163.8	193.2	216.8	352.0	0.77	0.83	Ke*** DN 16	DN 15 PN 400	3/4" 2500RTJ
30	28.27	120.4	154.4	179.8	235.8	278.2	312.1	254.0	0.81	0.85	Ke*** DN 16	DN 15 PN 320	3/4" 1500RF
36	40.72	173.4	222.3	258.9	339.6	400.6	449.5	176.0	0.83	0.86	Ke*** DN 16	DN 15 PN 250	1" 1500RF
38	45.36	193.3	247.7	288.5	378.3	446.4	500.8	158.0	0.84	0.87	Ke*** DN 16	DN 15 PN 160	1" 1500RF
40	50.27	214.1	274.4	319.7	419.2	494.6	554.9	143.0	0.85	0.87	Ke*** DN 16	DN 15 PN 160	1" 1500RF
44	60.82	259.1	332.1	386.8	507.2	598.5	671.5	118.0	0.85	0.87	Ke*** DN 25	DN 25 PN 160	1" 1500RF
46	66.48	283.2	363.0	422.8	554.4	654.1	733.9	108.0	0.86	0.88	Ke*** DN 25	DN 25 PN 160	1" 1500RF
48	72.38	308.3	395.2	460.4	603.7	712.2	799.1	108.0	0.86	0.88	Ke*** DN 25	DN 25 PN 160	1" 1500RF
50	78.54	334.6	428.8	499.5	655.0	772.8	867.1	91.0	0.86	0.88	Ke*** DN 25	DN 25 PN 100	1" 600RF
55	95.03	404.8	518.9	604.4	792.6	935.1	1,049.2	75.0	0.87	0.88	Ke*** DN 25	DN 25 PN 100	1" 600RF
60	113.10	481.8	617.5	719.3	943.2	1,112.9	1,248.6	63.0	0.87	0.89	Ke*** DN 25	DN 25 PN 64	1" 600RF
65	132.73	565.4	724.7	844.2	1,107.0	1,306.1	1,465.4	54.0	0.88	0.89	Ke*** DN 32	DN 40 PN 64	1 1/2" 600RF
70	153.94	655.8	840.5	979.0	1,283.8	1,514.8	1,699.5	46.0	0.88	0.89	Ke*** DN 32	DN 40 PN 64	1 1/2" 600RF
75	176.71	752.8	964.9	1,123.9	1,473.8	1,738.9	1,950.9	40.0	0.88	0.89	Ke*** DN 32	DN 40 PN 64	1 1/2" 300RF
80	201.06	856.5	1,097.8	1,278.8	1,676.9	1,978.4	2,219.7	35.0	0.88	0.89	Ke*** DN 40	DN 40 PN 40	1 1/2" 300RF
85	226.98	966.9	1,239.3	1,443.6	1,893.0	2,233.5	2,505.9	31.0	0.88	0.89	Ke*** DN 40	DN 40 PN 40	1 1/2" 300RF
90	254.47	1,084.0	1,389.4	1,618.4	2,122.3	2,504.0	2,809.3	28.0	0.89	0.89	Ke*** DN 40	DN 40 PN 40	1 1/2" 300RF
100	314.16	1,338.3	1,715.3	1,998.1	2,620.1	3,091.3	3,468.3	22.0	0.89	0.89	Ke*** DN 50	DN 50 PN 40	2" 150RF
115	415.48	1,769.9	2,268.5	2,642.4	3,465.1			17.0	0.89	0.89	Ke*** DN 65	DN 65 PN 40	2 1/2" 150RF
135	572.56	2,439.1	3,126.2	3,641.5	4,775.1			11.0	0.89	0.90	Ke*** DN 65	DN 65 PN 16	2 1/2" 150RF

*** Cone

Note:

- Further variants on request
- In layouts conforming to API a power reserve of at least 10% must be allowed for
- All hydraulic performance data are based on water at 20 °C

3.7 ORLITA® MF Hydraulic Diaphragm Metering Pumps

Identcode Ordering System

Motor-Driven Metering Pump ORLITA® MfS180 (MF4a)

| MF4a | Drive type | | |

3.7 ORLITA® MF Hydraulic Diaphragm Metering Pumps

3.7.6 ORLITA® MfS 600 (MF5a) Hydraulic Diaphragm Pump

Technical Data MfS 600 Single Pump 50 Hz

Plunger Ø	Stroke volume	Pump capacity Q_{th} in l/h per head at stroke rate n in 1/min Identcode specification: [3 to 8]						Max. pressure p	Efficiency WG at		Standard type of valve	Standardconnection Suction/ Discharge side	
		69	91	113	134	155	182		100% Pressure	50% Pressure			
mm	cm³/ stroke	[3]	[4]	[5]	[6]	[7]	[8]	bar				DIN/ISO	ANSI/SME
26	20.43	84.2	111.0	138.3	163.9	189.6	223.4	783.0	0.62	0.76	DKu* DN 15	by arangement	to be agreed
30	28.27	116.6	153.6	191.4	226.8	262.4	309.3	565.0	0.69	0.79	Ke*** DN 16	by arangement	to be agreed
36	40.72	167.9	221.2	275.6	326.7	377.9	445.3	392.0	0.76	0.83	Ke*** DN 16	DN 15 PN 400	1" 2500RTJ
40	50.27	207.3	273.1	340.2	403.3	466.6	549.8	318.0	0.78	0.84	Ke*** DN 16	DN 15 PN 320	1" 2500RTJ
44	60.82	250.8	330.5	411.7	488.0	564.5	665.2	263.0	0.80	0.85	Ke*** DN 25	DN 25 PN 320	1" 2500RTJ
46	66.48	274.1	361.2	450.0	533.3	617.0	727.1	240.0	0.81	0.85	Ke*** DN 25	DN 25 PN 250	1" 1500RF
50	78.54	323.9	426.7	531.6	630.1	729.0	859.0	221.0	0.83	0.86	Ke*** DN 25	DN 25 PN 250	1" 1500RF
55	95.03	391.9	516.4	643.3	762.4	882.1	1,039.4	168.0	0.84	0.87	Ke*** DN 25	DN 25 PN 250	1" 1500RF
60	113.10	466.4	614.5	765.5	907.4	1,049.7	1,237.0	141.0	0.85	0.87	Ke*** DN 25	DN 25 PN 160	1" 1500RF
65	132.73	547.3	721.2	898.4	1,064.9	1,232.0	1,451.8	120.0	0.85	0.87	Ke*** DN 32	DN 40 PN 160	1 1/2" 1500RF
70	153.94	634.8	836.4	1,042.0	1,235.0	1,428.8	1,683.7	100.0	0.90	0.88	Ke*** DN 32	DN 40 PN 100	1 1/2" 600RF
75	176.71	728.7	960.2	1,196.1	1,417.8	1,640.2	1,932.8	90.0	0.86	0.88	Ke*** DN 32	DN 40 PN 100	1 1/2" 600RF
80	201.06	829.1	1,092.4	1,360.9	1,613.1	1,866.2	2,199.1	79.0	0.87	0.88	Ke*** DN 40	DN 40 PN 100	1 1/2" 600RF
85	226.98	936.0	1,233.3	1,536.4	1,821.0	2,106.8	2,482.6	70.0	0.87	0.88	Ke*** DN 40	DN 40 PN 100	1 1/2" 600RF
90	254.47	1,049.4	1,382.6	1,722.4	2,041.6	2,361.9	2,783.3	62.0	0.87	0.88	Ke*** DN 40	DN 40 PN 100	1 1/2" 600RF
100	314.16	1,295.5	1,706.9	2,126.5	2,520.5	2,916.0	3,436.1	50.0	0.88	0.89	Ke*** DN 50	DN 50 PN 64	2" 600RF
115	415.48	1,713.3	2,257.4	2,812.2	3,333.3	3,856.3		38.0	0.88	0.89	Ke*** DN 65	DN 65 PN 40	2 1/2" 300RF
125	490.87	2,024.2	2,667.1	3,322.6	3,938.2	4,556.2		32.0	0.89	0.89	Ke*** DN 65	DN 65 PN 40	2 1/2" 300RF
140	615.75	2,539.2	3,345.6	4,167.9	4,940.1	5,715.3		25.0	0.89	0.89	Ke*** DN 65	DN 65 PN 40	2 1/2" 300RF
160	804.25	3,316.5	4,369.8	5,443.7	6,452.4			19.0	0.89	0.89	Ke*** DN 65	DN 65 PN 40	2 1/2" 300RF
200	1,256.64	5,182.0	6,827.8	8,505.8	10,081.9			12.0	0.89	0.89	Ke*** DN 65	DN 65 PN 16	2 1/2" 300RF
240	1,809.56	7,462.1	9,832.0	12,248.4				8.0	0.89	0.90	Ke*** DN 65	DN 65 PN 16	2 1/2" 300RF

Technical Data MfS 600 Single Pump 60 Hz

Plunger Ø	Stroke volume	Pump capacity Q_{th} in l/h per head at stroke rate n in 1/min Identcode specification: [2 to 7]						Max. pressure p	Efficiency WG at		Standard type of valve	Standardconnection Suction/ Discharge side	
		74	82	109	135	160	186		100% Pressure	50% Pressure			
mm	cm³/ stroke	[2]	[3]	[4]	[5]	[6]	[7]	bar				DIN/ISO	ANSI/SME
26	20.43	91.0	101.1	133.2	165.9	196.7	227.5	783.0	0.62	0.76	DKu* DN 15	by arangement	to be agreed
30	28.27	126.0	139.9	184.4	229.7	272.2	314.9	565.0	0.69	0.79	Ke*** DN 16	by arangement	to be agreed
36	40.72	181.4	201.5	265.5	330.7	392.0	453.5	392.0	0.76	0.83	Ke*** DN 16	DN 15 PN 400	1" 2500RTJ
40	50.27	224.0	248.7	327.7	408.3	483.9	559.9	318.0	0.78	0.84	Ke*** DN 16	DN 15 PN 320	1" 2500RTJ
44	60.82	271.0	301.0	396.6	494.0	585.6	677.4	263.0	0.80	0.85	Ke*** DN 25	DN 25 PN 320	1" 2500RTJ
46	66.48	296.2	329.0	433.4	540.0	640.0	740.4	240.0	0.81	0.85	Ke*** DN 25	DN 25 PN 250	1" 1500RF
50	78.54	350.0	388.7	512.1	637.9	756.1	874.8	200.0	0.83	0.86	Ke*** DN 25	DN 25 PN 250	1" 1500RF
55	95.03	423.5	470.3	619.6	771.9	914.9	1,058.5	168.0	0.84	0.87	Ke*** DN 25	DN 25 PN 250	1" 1500RF
60	113.10	504.0	559.7	737.4	918.6	1,088.8	1,259.7	141.0	0.85	0.87	Ke*** DN 25	DN 25 PN 160	1" 1500RF
65	132.73	591.5	656.8	865.4	1,078.1	1,277.9	1,478.4	120.0	0.85	0.87	Ke*** DN 40	DN 40 PN 160	1 1/2" 1500RF
70	153.94	686.0	761.8	1,003.7	1,250.4	1,482.0	1,714.6	100.0	0.90	0.88	Ke*** DN 32	DN 40 PN 100	1 1/2" 600RF
75	176.71	787.5	874.5	1,152.2	1,435.4	1,701.3	1,968.3	90.0	0.86	0.88	Ke*** DN 32	DN 40 PN 100	1 1/2" 600RF
80	201.06	896.0	994.9	1,310.9	1,633.1	1,935.7	2,239.5	79.0	0.87	0.88	Ke*** DN 40	DN 40 PN 100	1 1/2" 600RF
85	226.98	1,011.5	1,123.2	1,479.9	1,843.6	2,185.3	2,528.1	70.0	0.87	0.88	Ke*** DN 40	DN 40 PN 100	1 1/2" 600RF
90	254.47	1,134.0	1,259.2	1,659.2	2,066.9	2,449.9	2,834.3	62.0	0.87	0.88	Ke*** DN 40	DN 40 PN 100	1 1/2" 600RF
100	314.16	1,400.0	1,554.6	2,048.3	2,551.8	3,024.6	3,499.1	50.0	0.88	0.89	Ke*** DN 50	DN 50 PN 64	2" 600RF
115	415.48	1,851.5	2,056.0	2,708.9	3,374.7	4,000.0		38.0	0.88	0.89	Ke*** DN 65	DN 65 PN 40	2 1/2" 300RF
125	490.87	2,187.4	2,429.1	3,200.5	3,987.1	4,725.9		32.0	0.89	0.89	Ke*** DN 65	DN 65 PN 40	2 1/2" 300RF
140	615.75	2,743.9	3,047.0	4,014.7	5,001.4	5,928.2		25.0	0.89	0.89	Ke*** DN 65	DN 65 PN 40	2 1/2" 300RF
160	804.25	3,583.9	3,979.8	5,243.7	6,532.5			19.0	0.89	0.89	Ke*** DN 65	DN 65 PN 40	2 1/2" 300RF
200	1,256.64	5,599.9	6,218.4	8,193.3	10,207.0			12.0	0.89	0.89	Ke*** DN 65	DN 65 PN 16	2 1/2" 300RF
240	1,809.56	8,063.8	8,954.5	11,798.4	14,698.1			8.0	0.89	0.90	Ke*** DN 65	DN 65 PN 16	2 1/2" 300RF

* Double ball

*** Cone

Note:

- Further variants on request
- In layouts conforming to API a power reserve of at least 10% must be allowed for
- All hydraulic performance data are based on water at 20 °C

3.7 ORLITA® MF Hydraulic Diaphragm Metering Pumps

Identcode Ordering System

Motor-Driven Metering Pump ORLITA® MfS600 (MF5a)

MF5a	Drive type																			
	H1	Main drive horizontal *				Z1	Main drive central *				AR	Drive module right-hand								
	V1	Main drive vertical *				AL	Drive module left-hand				M	Modified **								
	Plunger diameter																			
	026	26 mm	046	46 mm		070	70 mm		100	100 mm		200	200 mm							
	030	30 mm	050	50 mm		075	75 mm		115	115 mm		240	240 mm							
	036	36 mm	055	55 mm		080	80 mm		125	125 mm										
	040	40 mm	060	60 mm		085	85 mm		140	140 mm										
	044	44 mm	065	65 mm		090	90 mm		160	160 mm										
		Stroke rate 50 (60) Hz																		
		2	(-) 74 Strokes/min			4	93 (111) Strokes/min		6	140 (168) Strokes/min		8	182 (-) Strokes/min							
		3	71 (85) Strokes/min			5	126 (147) Strokes/min		7	179 Strokes/min										
			Liquid end material (including valve materials)																	
			S1	Stainless steel (see table, sheet 2)																
				Temperature of pumped medium																
				0	-10 °C to 80 °C			2	-40 °C to 60 °C			4	10 °C to 150 °C							
				1	-25 °C to 60 °C			3	10 °C to 115 °C											
					Displacer format															
					0	PTFE multi-layer diaphragm														
					1	PTFE multi-layer diaphragm with pressure gauge														
						Liquid end version														
						0	Standard				2	Standard + double valve								
						1	Standard with spring				3	Standard + double valve with spring								
							Hydraulic connection suction side													
							G	Thread DIN/ISO			A	Flange ANSI								
							N	Thread NPT/ANSI			D	Flange DIN/ISO								
								Hydraulic connection discharge side												
								G	Thread DIN/ISO		A	Flange ANSI								
								N	Thread NPT/ANSI		D	Flange DIN/ISO								
									Version											
									0	no features		2	Dosing head polished							
									1	Dosing head heating		3	Special paint finish							
										Power connector										
										A	Standard voltage 50Hz									
										B	Standard voltage 50Hz adjustable									
										H	Standard voltage 60Hz									
										K	Standard voltage 60Hz adjustable									
										0	Externally mounted pump									
										1	without motor with IEC flange									
										2	without motor with NEMA flange									
											Electrical protection system / explosion protection									
											0	IP 55		D	IP 56 EExn					
											1	IP 56		E	IP 56 EExe					
											A	IP 55 EExn		F	IP 56 EExde					
											B	IP 55 EExe		K	IP 65 EExde					
											C	IP 55 EExde								
												Electrical options								
												0	no options							
												1	Stroke sensor							
													Stroke length adjustment							
													0	manual						
													1	0/4-20 mA without Ex						
													2	0/4-20 mA Ex Zone 2						
													3	0/4-20 mA Ex Zone 1						
													4	0/4-20 mA Ex without EX offshore						
													5	0/4-20 mA Ex Zone 2 offshore						
													6	0/4-20 mA Ex Zone 1 offshore						
														Environmental conditions						
														0	-20 °C to 40 °C					
														1	-40 °C to 40 °C					
														2	0 °C to 55 °C					
															Approvals					
															0	CE				
															1	API 675				
															2	VDMA				
															3	ATEX				
															4	ATEX / API 675				
															5	VDMA / ATEX				

*For further pump configurations see Type Of Drive page → 3-41

** Modified design (M) is available with every Identcode feature

3.7 ORLITA® MF Hydraulic Diaphragm Metering Pumps

3.7.7 ORLITA® MfS 1400 (MF6a) Hydraulic Diaphragm Pump

Technical Data MfS 1400 Single Pump 50 Hz

Plunger Ø	Stroke volume	Pump capacity Q_{th} in l/h per head at stroke rate n in 1/min Identcode specification: [3 to 8]						Max. pressure p	Efficiency WG at		Standard type of valve	Standardconnection Suction/ Discharge side	
		83	98	112	129	148	171		100% Pressure	50% Pressure			
mm	cm³/ stroke	[3]	[4]	[5]	[6]	[7]	[8]	bar				DIN/ISO	ANSI/SME
30	42.41	211.3	248.6	284.6	328.7	376.6	435.0	630.0	0.67	0.78	Ke*** DN 16	by arangement	to be agreed
40	75.40	375.6	442.0	505.9	584.3	669.5	773.3	435.0	0.75	0.83	Ke*** DN 25	DN 25 PN 400	1" 2500RTJ
42	83.13	414.2	487.3	557.7	644.2	738.1	852.6	435.0	0.76	0.83	Ke*** DN 25	DN 25 PN 400	1" 2500RTJ
44	91.23	454.5	534.8	612.1	707.0	810.1	935.7	394.0	0.76	0.83	Ke*** DN 25	DN 25 PN 400	1" 2500RTJ
46	99.71	496.8	584.5	669.0	772.7	885.4	1,022.7	361.0	0.77	0.83	Ke*** DN 25	DN 25 PN 400	1" 2500RTJ
50	117.81	587.0	690.6	790.4	912.9	1,046.1	1,208.3	305.0	0.79	0.84	Ke*** DN 25	DN 25 PN 320	1" 2500RTJ
55	142.55	710.2	835.6	956.4	1,104.6	1,265.8	1,462.0	250.0	0.81	0.85	Ke*** DN 25	DN 25 PN 250	1" 1500RTJ
60	169.65	845.2	994.4	1,138.2	1,314.6	1,506.4	1,740.0	212.0	0.82	0.86	Ke*** DN 25	DN 25 PN 250	1" 1500RTJ
65	199.10	991.9	1,167.1	1,335.8	1,542.8	1,767.9	2,042.0	180.0	0.83	0.87	Ke*** DN 32	DN 40 PN 250	1 1/2" 1500RF
70	230.91	1,150.4	1,353.5	1,549.2	1,789.3	2,050.3	2,368.3	155.0	0.84	0.87	Ke*** DN 40	DN 40 PN 160	1 1/2" 1500RF
75	265.07	1,320.6	1,553.8	1,778.4	2,054.1	2,353.7	2,718.7	135.0	0.85	0.87	Ke*** DN 40	DN 40 PN 160	1 1/2" 1500RF
80	301.59	1,502.6	1,767.9	2,023.5	2,337.1	2,678.0	3,093.3	119.0	0.85	0.87	Ke*** DN 40	DN 40 PN 160	1 1/2" 1500RF
90	381.70	1,901.7	2,237.5	2,561.0	2,957.9	3,389.3	3,914.9	94.0	0.90	0.90	Ke*** DN 50	DN 50 PN 100	2" 600RF
100	471.24	2,347.8	2,762.3	3,161.7	3,651.7	4,184.4	4,833.2	76.0	0.87	0.88	Ke*** DN 65	DN 65 PN 100	2 1/2" 600RF
115	623.21	3,105.0	3,653.2	4,181.3	4,829.3	5,533.8	6,391.9	57.0	0.88	0.89	Ke*** DN 65	DN 65 PN 64	2 1/2" 600RF
140	923.63	4,601.7	5,414.2	6,196.9	7,157.3	8,201.4	9,473.1	38.0	0.88	0.89	Ke*** DN 65	DN 65 PN 40	2 1/2" 300RF
160	1,206.37	6,010.4	7,071.5	8,093.9	9,348.3	10,712.0	12,373.0	29.0	0.89	0.89	Ke*** DN 80	DN 80 PN 40	3" 300RF
200	1,884.96	9,391.2	11,049.3	12,646.7	14,606.7	16,737.4		19.0	0.89	0.89	Ke*** DN 100	DN 100 PN 25	4" 150RF
280	3,694.51	18,406.8	21,656.6	24,787.5	28,629.1			9.0	0.89	0.90	Ke*** DN 100	DN 100 PN 16	4" 150RF

Technical Data MfS 1400 Single Pump 60 Hz

Plunger Ø	Stroke volume	Pump capacity Q_{th} in l/h per head at stroke rate n in 1/min Identcode specification: [2 to 7]						Max. pressure p	Efficiency WG at		Standard type of valve	Standardconnection Suction/ Discharge side	
		78	100	117	134	155	178		100% Pressure	50% Pressure			
mm	cm³/ stroke	[2]	[3]	[4]	[5]	[6]	[7]	bar				DIN/ISO	ANSI/SME
30	42.41	197.6	253.6	298.3	341.5	394.4	451.9	630.0	0.67	0.78	Ke*** DN 16	by arangement	to be agreed
40	75.40	351.2	450.8	530.4	607.0	701.1	803.4	435.0	0.75	0.83	Ke*** DN 25	DN 25 PN 400	1" 2500RTJ
42	83.13	387.2	497.0	584.7	669.3	773.0	885.7	435.0	0.76	0.83	Ke*** DN 25	DN 25 PN 400	1" 2500RTJ
44	91.23	425.0	545.4	641.7	734.5	848.4	972.1	394.0	0.76	0.83	Ke*** DN 25	DN 25 PN 400	1" 2500RTJ
46	99.71	464.5	596.2	701.4	802.8	927.2	1,062.5	361.0	0.77	0.83	Ke*** DN 25	DN 25 PN 400	1" 2500RTJ
50	117.81	548.8	704.3	828.7	948.5	1,095.5	1,255.3	305.0	0.79	0.84	Ke*** DN 25	DN 25 PN 320	1" 2500RTJ
55	142.55	664.0	852.3	1,002.7	1,147.7	1,325.6	1,518.9	250.0	0.81	0.85	Ke*** DN 25	DN 25 PN 250	1" 1500RTJ
60	169.65	790.2	1,014.3	1,193.3	1,365.8	1,577.5	1,807.6	212.0	0.82	0.86	Ke*** DN 25	DN 25 PN 250	1" 1500RTJ
65	199.10	927.4	1,190.3	1,400.5	1,603.0	1,851.4	2,121.5	180.0	0.83	0.87	Ke*** DN 32	DN 40 PN 250	1 1/2" 1500RF
70	230.91	1,075.6	1,380.5	1,624.2	1,859.1	2,147.2	2,460.4	155.0	0.84	0.87	Ke*** DN 40	DN 40 PN 160	1 1/2" 1500RF
75	265.07	1,234.7	1,584.8	1,864.6	2,134.1	2,464.9	2,824.4	135.0	0.85	0.87	Ke*** DN 40	DN 40 PN 160	1 1/2" 1500RF
80	301.59	1,404.8	1,803.1	2,121.5	2,428.2	2,804.5	3,213.6	119.0	0.85	0.87	Ke*** DN 40	DN 40 PN 160	1 1/2" 1500RF
90	381.70	1,778.0	2,282.1	2,685.0	3,073.1	3,549.4	4,067.2	94.0	0.90	0.90	Ke*** DN 50	DN 50 PN 100	2" 600RF
100	471.24	2,195.0	2,817.4	3,314.8	3,794.0	4,382.0	5,021.2	76.0	0.87	0.88	Ke*** DN 65	DN 65 PN 100	2 1/2" 600RF
115	623.21	2,903.0	3,726.0	4,383.8	5,017.6	5,795.2	6,640.6	57.0	0.88	0.89	Ke*** DN 65	DN 65 PN 64	2 1/2" 600RF
140	923.21	4,302.3	5,522.0	6,497.0	7,436.2	8,588.7	9,841.6	38.0	0.88	0.89	Ke*** DN 65	DN 65 PN 40	2 1/2" 300RF
160	1,206.37	5,619.3	7,212.5	8,485.9	9,712.6	11,217.9	12,854.4	29.0	0.89	0.89	Ke*** DN 80	DN 80 PN 40	3" 300RF
200	1,884.96	8,780.2	11,269.5	13,259.1	15,176.0	17,528.0		19.0	0.89	0.89	Ke*** DN 100	DN 100 PN 25	4" 150RF
280	3,694.51	17,209.2	22,088.2	25,987.9	29,745.0			9.0	0.89	0.90	Ke*** DN 100	DN 100 PN 16	4" 150RF

*** Cone

Note:
- Further variants on request
- In layouts conforming to API a power reserve of at least 10% must be allowed for
- All hydraulic performance data are based on water at 20 °C

3.7 ORLITA® MF Hydraulic Diaphragm Metering Pumps

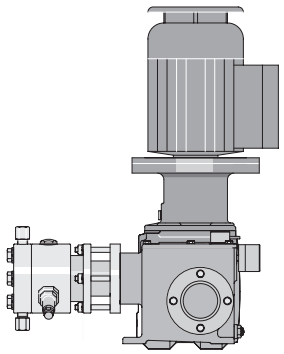
Identcode Ordering System

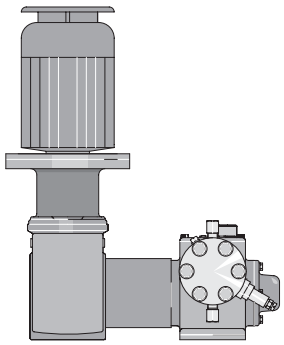
Motor-Driven Metering Pump ORLITA® MfS1400 (MF6a)

| | | |

3.8 ORLITA® MH Hydraulic Diaphragm Metering Pumps

3.8.1 ORLITA® MH Hydraulic Diaphragm Pump With Metal Diaphragm





pk_2_122
MhS 35-5

Hydraulically operated diaphragm head. A metal diaphragm forms a hermetic seal between the liquid and hydraulic ends.

During both discharge and suction strokes the diaphragm is balanced by the hydraulic liquid which is displaced by the plunger.

A pressure relief valve and an automatic vent valve for the hydraulic chamber are integrated in the pump head. The valve-free forced reflow of the internal oil leakage operates wear free and guarantees optimum metering accuracy.

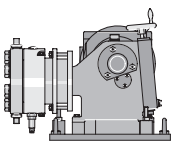
The suction and discharge valves are either cone, ball or prismatic depending on the design width and operating pressure.

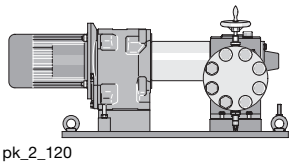
All parts in contact with the feed chemical are made of stainless steel.

High pressure diaphragm pumps on request

Pump type	Hydraulic piston Ø	Volume	Capacity (theo.) in l/h at strokes/min 50 Hz					Max. pressure
	mm	cm³/stroke	70	88	108	140	200	bar
MhS 18/	5	0.29	1.2	1.6	1.9	2.5	3.5	500.0
	6	0.42	1.8	2.2	2.7	3.6	5.1	500.0
	7	0.58	2.4	3.0	3.7	4.8	6.9	400.0
	8	0.75	3.2	4.0	4.9	6.3	9.0	320.0
	10	1.18	4.9	6.2	7.6	9.9	14.1	222.0
	12	1.70	7.1	9.0	11.0	14.3	20.4	154.0
	16	3.02	12.7	15.9	19.5	25.3	36.2	87.0
	20	4.71	19.8	24.9	30.5	39.6	56.5	55.0

Pump type	Hydraulic piston Ø	Volume	Capacity (theo.) in l/h at strokes/min 50 Hz					Max. pressure
	mm	cm³/stroke	70	88	108	140	200	bar
MhS 35/	7	0.77	3.2	4.1	5.0	6.5	9.2	900.0
	8	1.01	4.2	5.3	6.5	8.4	12.1	630.0
	10	1.57	6.6	8.3	10.2	13.2	18.8	445.0
	12	2.26	9.5	11.9	14.7	19.0	27.1	309.0
	14	3.08	12.9	16.3	20.0	25.9	36.9	227.0
	16	4.02	16.9	21.2	26.1	33.8	48.3	174.0
	18	5.09	21.4	26.9	33.0	42.8	61.1	137.0
	20	6.28	26.4	33.2	40.7	52.8	75.4	111.0
	22	7.60	31.9	40.1	49.3	63.9	91.2	71.0
	32	16.08	67.6	84.9	104.0	135.0	193.0	40.0
	45	31.81	134.0	168.0	206.0	267.0	382.0	22.0

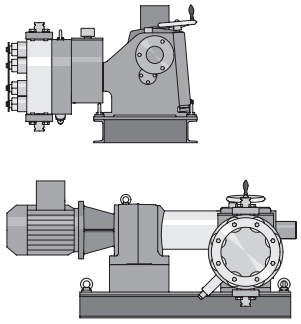




pk_2_120
MhS 80/22

Pump type	Hydraulic piston Ø	Volume	Capacity (theo.) in l/h at strokes/min 50 Hz						Max. pressure
	mm	cm³/stroke	70	90	115	134	152	194	bar
MhS 80/	14	3.08	12.9	16.6	21.3	24.8	28.1	35.9	900.0
	16	4.02	16.9	21.7	27.7	32.3	36.7	46.8	696.0
	18	5.09	21.4	27.5	35.1	40.9	46.4	59.2	550.0
	20	6.28	26.4	33.9	43.3	50.5	57.3	73.1	445.0
	22	7.60	31.9	41.0	52.4	61.1	69.3	88.5	368.0
	25	9.82	41.2	53.0	67.8	79.0	89.6	114.0	285.0

3.8 ORLITA® MH Hydraulic Diaphragm Metering Pumps

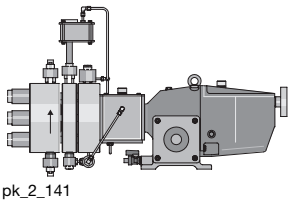


pk_2_088_1
MhS 600/26

Pump type	Hydraulic piston Ø	Volume	Capacity (theo.) in l/h at strokes/min 50 Hz						Max. pressure
	mm	cm³/ stroke	69	91	113	134	155	182	bar
MhS 600/	26	20.43	84.2	111.0	138.0	163.0	189.0	223.0	760.0
	28	24.63	101.0	133.0	166.0	197.0	228.0	269.0	630.0
	30	28.37	116.0	153.0	191.0	226.0	262.0	309.0	565.0
	32	32.17	132.0	174.0	217.0	258.0	298.0	351.0	497.0

Pump type	Hydraulic piston Ø	Volume	Capacity (theo.) in l/h at strokes/min 50 Hz						Max. pressure
	mm	cm³/ stroke	83	98	112	129	148	171	bar
MhS 1400/	30	42.41	211.0	248.0	284.0	328.0	376.0	435.0	800.0
	32	48.25	240.0	282.0	323.0	373.0	428.0	494.0	700.0
	36	91.07	304.0	358.0	409.0	473.0	542.0	626.0	589.0
	40	75.40	375.0	442.0	505.0	584.0	669.0	773.0	477.0

Technical Data MH High Pressure Diaphragm Metering Pump With Single Metal Diaphragm



pk_2_141
MhR 150/6

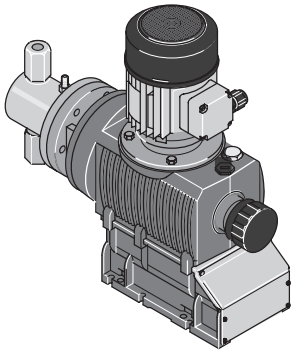
Pump type	Hydraulic piston Ø	Volume	Capacity (theo.) in l/h at strokes/min 50 Hz					Max. pressure
	mm	cm³/stroke	70	88	108	140	200	bar
MhS 35/	5	0.39	1.6	2.1	2.5	3.3	4.7	1,782.0

Pump type	Hydraulic piston Ø	Volume	Capacity (theo.) in l/h at strokes/min 50 Hz				Max. pressure
	mm	cm³/stroke	56	75	112	140	bar
MhR 150/	6	0.90	3.0	4.1	6.1	7.6	3,000.0
	7	1.23	4.1	5.5	8.3	10.3	3,000.0

Pump type	Hydraulic piston Ø	Volume	Capacity (theo.) in l/h at strokes/min 50 Hz						Max. pressure
	mm	cm³/stroke	69	91	113	134	155	182	bar
MhS 600/	11	3.80	15.7	20.6	25.7	30.5	35.3	41.6	3,000.0

3.9 Sigma/ 2 Plunger Metering Pumps

3.9.1 Sigma Plunger Metering Pumps



pk_2_006

The Sigma/ 2 motor driven plunger metering pump has a high strength metal-lined housing for those components subject to load, and an additional plastic housing to protect against corrosion. It has a capacity range of 2-76 l/h at a max. back pressure of 12-320 bar. The pump capacity is adjusted by varying the stroke length (15 mm) in 0.2 % steps via a self locking rotary knob.

The reproducible metering accuracy is better than ±1 % providing installation has been correctly carried out, and in the stroke length range of 30 -100 %. (Follow instructions given in operating instructions manual.)

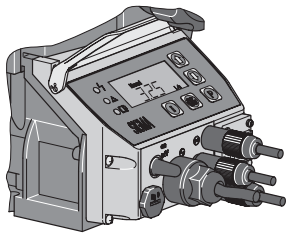
The rugged, corrosion resistant metal and plastic housing is combined with a choice of three gearbox ratios and four stainless steel 1.4571 liquid end sizes. To facilitate adaptation of the pumps to the widest possible range of processing requirements the S2Ca Sigma controller offers either contact or analogue signal (e.g. 0/4-20 mA) control options.

For safety reasons, all motor driven metering pumps must be equipped with adequate protection against electrical overload.

Sigma Basic Type SBKa

The Sigma Basic is a motor driven metering pump with no internal electronic control system. The S2Ba has a number of different motor options, including the three phase standard (standard IP 55) motor, or the single phase AC motor. We also supply metering pumps with ATEX-approval for use in EXe and EXde zones.

Different flanges are available so that customers can use their own motor to drive the pump.



pk_2_104
Sigma Controller

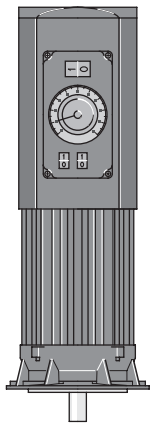
Sigma Control Type SCKa

The Sigma/ 2 microprocessor version (standard IP 65) allows rapid and reliable adjustment to fluctuating metering requirements.

The control unit has the same control surface as the gamma/ L metering pump.

The microprocessor controller of the Sigma pumps, featuring the optimum combination of variable AC frequency combined with digital stroking frequency, ensures exact metering even in the lower minimum range due to individual stroke control.

With five programming keys the individual pump functions are easy to set. A backlit LCD gives information about the prevailing operating status. LEDs along with a fault-indicating or pacing relay act as operating and warning indicators to ensure monitoring of the pump function.



pk_2_103

Sigma Basic Type Control Functions (S2Ba)

Stroke length actuator/controller

Actuator for automatic stroke length adjustment, actuating period approx. 1 sec for 1 % stroke length, 1 kΩ response signal potentiometer, enclosure rating IP 54.

Controller consists of actuator with servomotor and integrated servo control for stroke length adjustment via a standard signal. Standard signal input 0/4-20 mA, corresponds to stroke length 0 - 100 %. Automatic/manual operation selection key for manual stroke adjustment. Mechanical status display of actual stroke length value output 0/4-20 mA for remote display.

Variable speed motors with integrated speed controller (identcode characteristic V)

Power supply 1 ph 230 V, 50/60 Hz, 0.37 kW.

External control with 0/4-20 mA (see pk_2_103)

(Speed Controllers see p. → 2-50)

Speed controllers in metal housing (identcode characteristic Z)

The speed controller assembly consists of a speed controller and a 0.37 kW variable speed motor.

(Speed Controllers see p. → 2-50)

3.9 Sigma/ 2 Plunger Metering Pumps

Technical data

Typ Sigma/ 2 HK	With motor 1500 rpm at 50 Hz				With motor 1800 rpm at 60 Hz				Suction head	Perm. admiss. pressure suction side	Connector Suction/ Discharge Side	Shipping weight
	Delivery rate at max. backpressure			Max. stroke rate	Delivery rate at max. backpressure			Max. stroke rate				
	bar	l/h	ml/ stroke	Strokes/ min	psi	l/h	gph	Strokes/ min	mWC	bar	Rp-DN	kg
32002	320	1.9	0.46	71	4,627	2.3	0.61	84	5.0	160	1/4	24
23004	230	4.0	0.52	129	3,335	4.8	1.27	154	5.0	115	1/4	24
10006	100	6.4	0.55	195	1,450	7.6	2.01	233	5.0	50	1/4	24
14006	140	6.1	1.42	71	2,030	7.1	1.88	84	4.0	70	1/4	24
10011	100	11.0	1.43	129	1,450	13.1	3.46	153	4.0	50	1/4	24
05016	50	16.7	1.43	195	725	20.0	5.28	233	4.0	25	1/4	24
07012	70	12.4	2.90	71	1,015	14.8	3.91	85	4.0	35	1/4	24
04522	45	22.5	2.91	129	652	26.7	7.05	153	4.0	22.5	1/4	24
02534	25	34.1	2.92	195	363	40.8	10.78	233	4.0	12.5	1/4	24
04022	40	22.4	5.26	71	580	26.5	7.00	84	4.0	20	3/8	25
02541	25	41.5	5.37	129	363	49.2	13.00	153	4.0	12.5	3/8	25
01264	12	64.0	5.45	195	174	76.0	20.08	233	4.0	6	3/8	25

Note: For the S2Ca pump types the 60 capacity data (since internal 60 Hz operation) applies, however max. 200 strokes/min.

Materials On Each Model In Contact With Chemicals

Material	Liquid End	Suction/ Discharge connector	Seals	Valve Balls	Ball Seat
SST	Stainless steel	Stainless steel	PTFE /	Ceramic	Stainless steel
	no. 1.4571/1.4404	no. 1.4571/1.4404	PTFE with graphite		no. 1.4571/1.4404

Motor Data

Identcode characteristic		Power supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	0.25 kW	
		250-280 V/440-480 V	60 Hz	0.25 kW	
M	1 ph AC, IP 55	230 V ± 5%	50/60 Hz	0.18 kW	
N	1 ph AC, IP 55	115 V ± 5 %	60 Hz	0.18 kW	
L1	3 ph, II2GEExellT3	220-240 V/380-420 V	50 Hz	0.18 kW	
L2	3 ph, II2GEExdIICT4	220-240 V/380-420 V	50 Hz	0.18 kW	with PTC thermistor, speed adjustment range 1:5
P1	3 ph, II2GEExellT3	250-280 V/440-480 V	60 Hz	0.18 kW	
P2	3 ph, II2GEExdIICT4	250-280 V/440-480 V	60 Hz	0.21 kW	with PTC thermistor, speed adjustment range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	0.37 kW	with PTC thermistor, speed adjustment range 1:20 with external fan 1 ph 230 V; 50/60 Hz
V0	1 ph, IP 55	230 V ± 5 %	50/60 Hz	0.37 kW	variable-speed motor with integrated frequency converter

For further information you can request motor data sheets.
Custom motors and/or custom motor flanges may be supplied on request.

Notice for use in Ex-zone:
After 01.07.2003, only pumps with the corresponding EC-Ex-RL 94/9 code can be used in explosion-threatened operating areas. The explosion group, category and enclosure rating indicated in the identification shall comply with or exceed the conditions in the intended place of use.

3.9 Sigma/ 2 Plunger Metering Pumps

3.9.2 Sigma HK Spare Parts Kits

Consisting of: 1 ceramic metering plunger, 4 valve balls, 4 ball seat discs, 2 ball PTFE/graphite ball seals, 2 plunger guides, 14 flat seals, 2 O-rings.

	Type	Order no.
Liquid end FK 08	applies to identcode: 32002, 23004, 10006	1001572
Liquid end FK 12,5	applies to identcode: 14006, 10011, 05016	910470
Liquid end FK 25	applies to identcode: 07012, 04522, 02534	910471
Liquid end FK 50	applies to identcode: 04022, 02541, 01264	910472

Notice for use in Ex-zone:

After 01.07.2003, only pumps with the corresponding EC-Ex-RL 94/9 code can be used in explosion-threatened operating areas. The explosion group, category and enclosure rating indicated in the identification shall comply with or exceed the conditions in the intended place of use.

3.9 Sigma/ 2 Plunger Metering Pumps

3.9.3 Identcode Ordering System

Sigma Basic Type (S2Ba HK)

S2Ba	Drive type												
	HK	Main drive, plunger											
		Type*											
		32002											
		23004											
		10006											
		14006											
		10011											
		05016											
		07012											
		04522											
		02534											
		04022											
		02541											
		01264											
			Material: Liquid end										
			SS	Stainless steel									
				Seals/diaphragm material									
				T	PTFE								
					Diaphragm								
					4	Plunger (oxide ceramic)							
						Liquid end version							
						0	No spring (standard)						
						1	With 2 valve springs, Hastelloy C, 0.1 bar						
							Hydraulic connection						
							0	Standard threaded connector (according to technical data)					
								Version					
								0	With ProMinent® logo (standard)				
								1	Without ProMinent® logo				
								M	Modified				
									Electrical power supply				
									S	3 ph, 230 V/400 V 50/60 Hz, 0.18 kW			
									M	1 ph, AC, 230 V/ 50/60 Hz, 0.18 kW			
									N	1 ph, AC 115 V 60 Hz, 0.18 kW			
									L	3 ph, 230 V/400 V, 50 Hz, (EExe, EExd), 0.18 kW			
									P	3 ph, 230 V/400 V, 60 Hz, (EExe, EExd), 0.18 kW			
									R	3 ph, variable speed motor, 230/400 V, 0.37 kW			
									V (0)	Variable speed motor with integrated SC 1 pH, 230 V, 50/60 Hz			
									Z	1 ph, variable speed set 230 V, 50/60 Hz			
									1	No motor, with B 14 flange (size 71 (DIN)			
									2	No motor, C 56 flange (NEMA)			
									3	No motor, B 5 size 63 (DIN)			
										Enclosure rating			
										0	IP 55 (standard)		
										1	Exe motor version ATEX-T3		
										2	Exde motor version ATEX-T4		
										A	ATEX power end		
											Stroke sensor		
											0	No stroke sensor (standard)	
											2	Pacing relay (reed relay)	
											3	Stroke sensor (Namur) for hazardous locations	
												Stroke length adjustment	
												0	Manual (standard)
												1	With stroke positioning motor, 230 V/50/60 Hz
												2	With stroke positioning motor, 115 V/50/60 Hz
												3	With stroke control motor 0...20 mA 230 V/50/60 Hz
												4	With stroke control motor 4...20 mA 230 V/50/60 Hz
												5	With stroke control motor 0...20 mA 115 V/50/60 Hz
												6	With stroke control motor 4...20 mA 115 V/50/60 Hz

* figures 1 - 3 = back pressure [bar], figures 4 + 5 = feed rate [l/h]

3.9 Sigma/ 2 Plunger Metering Pumps

3.9.4 Identcode Ordering System

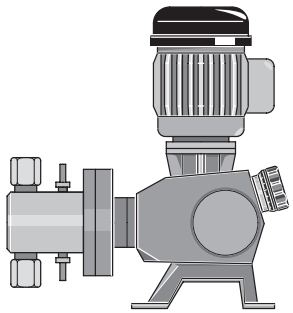
Sigma Control Type (S2Ca HK)

S2Ca	Drive type															
	HK	Main drive, plunger														
		Type*														
		23002	320 bar, 2.3 l/h													
		23004	320 bar, 4.8 l/h													
		10006	100 bar, 6.4 l/h													
		14006	140 bar, 7.1 l/h													
		10011	100 bar, 13.1 l/h													
		05016	50 bar, 16.7 l/h													
		07012	70 bar, 14.8 l/h													
		04522	45 bar, 26.7 l/h													
		02534	25 bar, 34.1 l/h													
		04022	40 bar, 26.5 l/h													
		02541	25 bar, 49.2 l/h													
		01264	12 bar, 64 l/h													
			Material: Liquid end													
			SS	Stainless steel												
				Seals/diaphragm material												
				T	PTFE											
					Diaphragm											
					4	Plunger (oxide ceramic)										
						Liquid end version										
						0	No spring (standard)									
						1	With 2 valve springs, Hastelloy C 4, 0.1 bar									
							Hydraulic connection									
							0	Standard threaded connector (according to technical data)								
								Version								
								0	With ProMinent® logo							
								1	Without ProMinent® logo							
									Electrical power supply							
									U	1 ph 100-230 V ±10 %, 50/60 Hz						
										Cable and plug						
										A	2 m European					
										B	2 m Swiss					
										C	2 m Australian					
										D	2 m USA					
											Relay					
											0	No relay				
											1	With fault indicating relay 1x changeover 230 V – 2A				
											3	With fault indicating relay 1x changeover 230 V – 2A				
											4	As 1 with pacing relay 2x normally open 24 V – 100 mA				
											5	As 3 with pacing relay 2x normally open 24 V – 100 mA				
											A	shut-off and warning relays normally close 2x normally open 24 V – 100 mA				
											C	As 1 + 4-20mA output = stroke length x rate 1x normally open 24 V – 100 mA				
											F	Power relay normally closed 1 x changeover 230 V – 8 A				
												Control variant				
												0	Manual + external with pulse control			
												1	Manual + external + pulse control + analogue			
													Access code			
													0	No access code		
													1	With access code		
														Metering monitor		
														0	Input with pulse evaluation	
														1	Input with cont. evaluation	
															Stroke length adjustment	
															0	Manual

* figures 1 - 3 = back pressure [bar], figures 4 + 5 = feed rate [l/h]]

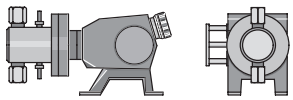
3.10 Meta Plunger Metering Pumps

3.10.1 Meta Plunger Metering Pumps



pk_2_010

The Meta plunger pump is a standard sized metering pump driven by an 0.18 kW/37 kW dual wound three phase motor. 230/400 V, 50/60 Hz power supply, enclosure rating IP 55, insulation class F. Stroke length is adjustable between 0…15.5 mm in 0.2 % steps. Worm gears in a choice of four reduction ratios, and cam / spring follower mechanisms are built into a salt water-resistant and acrylic resin coated housing. Liquid end parts in contact with chemicals are listed below. The suction lift varies depending upon the density and viscosity of the feed chemical, and connecting pipework dimensions. Under defined conditions and providing installation is correct, reproducible metering accuracy is better than ±0.5 % at a stroke length range of between 10 % and 100 %. (Guidelines given in the instruction manual must be followed precisely.) For technical safety reasons, appropriate equipment must be installed to prevent current overload to motorised metering pumps.



pk_2_011

Meta Add-On Pumps

Meta add-on pumps can be connected up with Meta main pumps to form duplex or triplex pumps. (In certain cases more add-on pumps can be operated with a main pump with reduced back pressures). The multiplexed pumps can also be ordered and supplied as complete systems, consisting of a main pump and the required number of add-on pumps. Multiplexed pumps can also be retrofitted by the operator. All necessary fittings and connectors are supplied with the add-on pump. They are connected to the main pump at the power output side, i.e. the stroke rate of the add-on pump is identical to that of the main pump.

Actuation of Meta metering pumps

(Speed Controllers see p. → 2-50)

Speed controllers in metal housing (Identcode characteristic Z)

Frequency changer built into IP 54 protective housing and main switch designed for max. 0.37 kW motor output.

Externally controlled with 0/4-20 mA / 0-10 V to correspond to 0-50 (60) Hz output frequency.

Integrated controller with versatile functions e.g. switching between external/internal control. In the case of internal control, frequency input via arrow keys. Multi-lingual fault message display etc. and motor temperature monitoring (thermistor-protection).

The speed controller assembly consists of a speed controller and a variable speed motor (see also identcode characteristic R).

3.10 Meta Plunger Metering Pumps

Technical data

Type MTKa	With motor 1500 rpm at 50 Hz				With motor 1800 rpm at 60 Hz			Suction head	Perm. admiss. pressure suction side	Connector Suction/ Discharge Side	Motor rating	Shipping weight
	Delivery rate at max. backpressure			Max. stroke rate	Delivery rate at max. backpressure		Max. stroke rate					
	bar	l/h	ml/ stroke	Strokes/ min	psi	l/h / gph	Strokes/ min	mWC	bar	Rp-DN	W	kg
21606	216	6.1	1.42	72	3,130	7.3/1.9	86	4.0	108	1/4	180	18
24006	240	6.1	1.42	72	3,477	7.3/1.9	86	4.0	120	1/4	370	20
16208	162	8.1	1.42	96	2,347	9.8/2.6	115	4.0	81	1/4	180	18
22508	225	8.1	1.42	96	3,260	9.8/2.6	115	4.0	112.5	1/4	370	20
12910	129	10.2	1.42	120	1,878	12.2/3.2	144	4.0	64.5	1/4	180	18
21610	216	10.2	1.42	120	3,130	12.2/3.2	144	4.0	108	1/4	370	20
10812	108	12.2	1.42	144	1,565	14.7/3.9	173	4.0	54	1/4	180	18
21012	210	12.2	1.42	144	3,043	14.7/3.9	173	4.0	105	1/4	370	20
10213	102	13.0	3.01	72	1,479	15.6/4.1	86	4.0	51	1/4	180	18
11313	113	13.0	3.01	72	1,644	15.6/4.1	86	4.0	56.5	1/4	370	20
07617	76	17.3	3.01	96	1,109	20.8/5.5	115	4.0	38	1/4	180	18
10617	106	17.3	3.01	96	1,541	20.8/5.5	115	4.0	53	1/4	370	20
06122	61	21.7	3.01	120	888	26.0/6.9	144	4.0	30.5	1/4	180	18
10222	102	21.7	3.01	120	1,479	26.0/6.9	144	4.0	51	1/4	370	20
05126	51	26.0	3.01	144	740	31.2/8.2	173	4.0	25.5	1/4	180	18
09926	99	26.0	3.01	144	1,438	31.2/8.2	173	4.0	49.5	1/4	370	20
05425	54	24.6	5.71	72	782	29.5/7.8	86	4.0	27	3/8	180	18
06025	60	24.6	5.71	72	869	29.5/7.8	86	4.0	30	3/8	370	20
04033	40	32.8	5.71	96	587	39.4/10.4	115	4.0	20	3/8	180	18
05633	56	32.8	5.71	96	815	39.4/10.4	115	4.0	28	3/8	370	20
03241	32	41.1	5.71	120	469	49.3/13.0	144	4.0	16	3/8	180	18
05441	54	41.1	5.71	120	782	49.3/13.0	144	4.0	27	3/8	370	20
02749	27	49.3	5.71	144	391	59.2/15.6	173	4.0	13.5	3/8	180	18
05249	52	49.3	5.71	144	761	59.2/15.6	173	4.0	26	3/8	370	20

Materials In Contact With Chemicals

Material	Metering Head	Suction/ Discharge Connector	Seals	Valve Balls	Valve Seat	Plungers
SST	Stainless steel	Stainless steel	PTFE	Ceramic	Stainless steel	Ceramic
	no. 1.4571/1.4404	no. 1.4571/1.4404	PTFE with graphite		no. 1.4571/1.4404	

Motor Data

Identcode characteristic	Power supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	0.18/0.37 kW	
		250-280 V/440-480 V	60 Hz	0.18/0.37 kW	
M	1 ph AC, IP 55	230 V ± 5%	50/60 Hz	0.37 kW	
N	1 ph AC, IP 55	115 V ± 5 %	60 Hz	0.37 kW	
L1	3 ph, II2GEExeIIT3	220-240 V/380-420 V	50 Hz	0.18/0.37 kW	
L2	3 ph, II2GEExdIICT4	220-240 V/380-420 V	50 Hz	0.18/0.37 kW	with PTC thermistor, speed adjustment range 1:5
P1	3 ph, II2GEExeIIT3	250-280 V/440-480 V	60 Hz	0.18/0.37 kW	
P2	3 ph, II2GEExdIICT4	250-280 V/440-480 V	60 Hz	0.18/0.37 kW	with PTC thermistor, speed adjustment range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	0.37 kW	with PTC thermistor, speed adjustment range 1:20 with external fan 1 ph 230 V; 50/60 Hz
V0	1 ph, IP 55	230 V ± 5 %	50/60 Hz	0.37 kW	variable-speed motor with integrated frequency converter

The motor output depends on the pump type (see techn. data).
For further information you can request motor data sheets.
Custom motors and/or custom motor flanges are available on request.

3.10.2 Identcode Ordering System

Meta Plunger Metering Pump Version a

MTKa	Drive type											
	H	Main drive										
	A	Add-on drive										
		Type*										
		02749	05441	10213	16208							
		03241	05633	10222	21012							
		04033	06025	10617	21606							
		05126	06122	10812	21610							
		05249	07617	11313	22508							
		05425	09926	12910	24006							
			Material: Liquid end									
			SS	Stainless steel								
				Seals/diaphragm material								
				T	PTFE							
					Diaphragm							
					S	Standard plunger, oxide ceramic						
						Liquid end version						
						0	No valve springs					
						1	With 2 valve springs, Hastelloy C, 0.1 bar					
							Hydraulic connection					
							0	Standard threaded connector (according to technical data)				
								Version				
								0	With ProMinent® logo (standard)			
								1	Without ProMinent® logo			
								M	Modified			
									Electrical power supply			
									S	3 ph, 230 V/400 V, 50/60 Hz (WBS)		
									M	1 ph, AC, 230 V, 50/60 Hz		
									N	1 ph, AC, 115 V, 60 Hz		
									L	3 ph, 230 V/400 V, 50 Hz, (Exe, Exd)		
									P	3 ph, 230 V/400 V, 60 Hz, (Exe, Exd)		
									R	3 ph, variable speed motor, 230 V/400 V		
									V (0)	Motor with integrated frequency converter		
									Z	1 ph, variable speed set 230 V, 50/60 Hz		
									0	Add-on pump (no motor)		
									1	No motor, with flange 90/63		
									2	No motor, with flange 140/71		
									3	No motor, with flange 160/71		
									4	No motor, with flange 56 C		
										Enclosure rating		
										0	IP 55 (standard)	
										1	Exe motor version ATEX-T3	
										2	Exde motor version ATEX-T4	
										A	ATEX power end	
											Stroke sensor	
											0	No stroke sensor (standard)
											1	With stroke sensor, Namur signal (Ex)
												Stroke length adjustment
												0 Manual (standard)
												1 With stroke positioning, 230 V/50/60 Hz
												2 With stroke positioning, 115 V/50/60 Hz
												A With stroke control motor 0...20 mA 230 V/50/60 Hz
												B With stroke control motor 4...20 mA 230 V/50/60 Hz
												C With stroke control motor 0...20 mA 115 V/50/60 Hz
												D With stroke control motor 4...20 mA 115 V/50/60 Hz

* figures 1 - 3 = back pressure [bar], figures 4 + 5 = feed rate [l/h]

3.10 Meta Plunger Metering Pumps

3.10.3 Spare Parts Kits

Spare parts kits for Meta (MTKa) Plunger Metering Pumps

consisting of:

1 ceramic plunger
4 valve balls
4 ball seat discs
2 PTFE /graphite plunger packing rings
2 plunger guides bands
14 flat seals
2 O-rings

	Order no.
Liquid end FK 12,5 Applies to identcode: 21606, 24006, 16208, 22508, 12910, 21610, 10812, 21012	910470
Liquid end FK 25 Applies to identcode: 10213, 11313, 07617, 10617, 06122, 10222, 05126, 09926	910471
Liquid end FK 50 Applies to identcode: 05425, 06025, 04033, 05633, 03241, 05441, 02749, 05249	910472

Base Frames for Meta MTMa and MTKa

A base frame is available for main and add-on pump combinations.

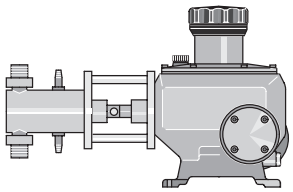
	Order no.
Base frame for main and one add-on pump	803897
Base frame for main and two add-on pumps	803898
Base frame for main and three add-on pumps	803899

Notice for use in Ex-zone:

After 01.07.2003, only pumps with the corresponding EC-Ex-RL 94/9 code can be used in explosion-threatened operating areas. The explosion group, category and enclosure rating indicated in the identification shall comply with or exceed the conditions in the intended place of use.

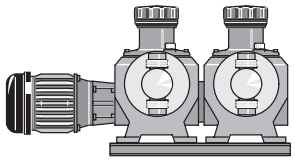
3.11 Makro TZ Plunger Metering Pumps

3.11.1 Makro TZ Plunger Metering Pumps



pk_2_019

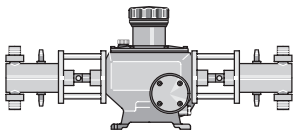
The Makro TZ plunger pump is a standard sized metering pump which can be driven by either a 0.75 kW or 1.5 kW dual wound three phase motor. 230/400 V, 50/60 Hz power supply, enclosure rating IP 55, insulation class F. Stroke length is 0...20 mm and is adjustable to within 0.5 % accuracy. The shift ring mechanism, in a choice of four reduction ratios, is built into a salt water-resistant and acrylic resin coated cast housing. Liquid ends are made of stainless steel 1.4571, and plungers are in oxide ceramic or stainless steel with a ceramic anti-wear coating. The suction lift varies depending upon the density and viscosity of the feed chemical, and connecting pipework dimensions. Under defined conditions and providing installation is correct, reproducible metering accuracy is better than ±0.5 % at a stroke length range of between 10 % and 100 %. (Guidelines given in the instruction manual must be followed precisely.) For technical safety reasons, appropriate equipment must be installed to prevent current overload to motorised metering pumps.



pk_2_018

Makro TZ TZKaA Add-On Pumps

Makro TZ add-on pumps (TZ-AK) can be connected up with Makro TZ main pumps (TZ-HK) to form duplex or triplex pumps. (In certain cases more add-on pumps can be operated with a main pump with reduced back pressures). The multiplexed pumps can also be ordered and supplied as complete systems, consisting of a TZ-HK and the required number of TZ-AKs. Multiplexed pumps can also be retrofitted by the operator. All necessary fittings and connectors are supplied with the TZ-AK. The TZ-AK stroke rate is set independently of the TZ-HK, as each TZ-AK governs its own reducing gear. The main power end can be fitted with a 2.2 kW/3 kW motor for this purpose. A base frame is required when using add-on pumps.



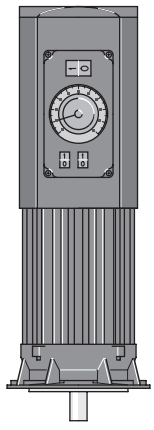
pk_2_020

Makro TZ Double Head Version TZKaD (Main Pump) /TZKaB (Add-On Pump)

The Makro TZ HKD and AKD are similar to simplex pumps, but with an additional liquid end.

The gearbox coupler causes the pumps to operate counter to one another, i.e. the discharge stroke in the first is matched by a suction stroke in the second.

Makro TZ Metering Pump Actuators



pk_2_103

Makro TZ stroke length-actuator/stroke controller

Makro TZ stroke actuatorZ

Stroke adjustment motor for automatic stroke length adjustment, adjustment time approx. 1 sec. for 1 % stroke length, fitted with 2 limit switches for min. /max. setting, 1 k Ohm feedback potentiometer; enclosure rating: IP 54. El. power supply 230 V (±10 %) , 50/60 Hz, 40 W. Mech. stroke length indicator fitted to Makro TZ power end.

Alternative current / higher enclosure rating / Ex-protection to order.

Makro TZ stroke controller

Stroke controller comprising actuator with stroke adjustment motor and integrated microprocessor controller for stroke length adjustment via a standard signal. Technical data see actuator.

Version:

Standard 0/4-20 mA current input corresponds to 0-100 % stroke length. Change over switch for manual/automatic mode. Key switch for stroke adjustment in manual operating mode. ßtext0
0/4-20 mA actual value-output for remote display.

Variable speed motors with integrated frequency converter (Identcode characteristic V)

Power supply 3 ph 230 V, 50/60 Hz, 2.2 kW.

Optional 0/4-20 mA external control. (see Fig. pk_2_103)

(Speed Controllers see p. → 2-50)

Speed controllers in metal housing (Identcode characteristic Z)

The speed controller set comprises frequency converter and 2.2 kW variable speed motor.

(Speed Controllers see p. → 2-50)

3.11 Makro TZ Plunger Metering Pumps

Technical data

Typ TZKa	With motor 1500 rpm at 50 Hz				With motor 1800 rpm at 60 Hz			Suction head	Connection, intake/ pressure side	Shipping weight	Hydraulic piston Ø
	Delivery rate at max. backpressure			Max. stroke rate	Delivery rate at max. backpressure		Max. stroke rate				
	bar	l/h	ml/ stroke	Strokes/ min	psi	l/h / gph	Strokes/ min	mWC	G–DN	kg	mm
320009	320	8.7	2.0	72	4,627	10/2.6	86	4.0	Rp 1/4**–8	50	12
320012	320	11.6	2.0	96	4,627	14/3.7	115	4.0	Rp 1/4**–8	50	12
320014	320	14.5	2.0	120	4,627	17/4.5	144	4.0	Rp 1/4**–8	50	12
320017	320	17.4	2.0	144	4,627	21/5.5	173	4.0	Rp 1/4**–8	50	12
320018	320	17.7	4.1	72	4,627	21/5.5	86	4.0	Rp 1/4**–8	50	17
320024	320	23.6	4.1	96	4,627	28/7.4	115	4.0	Rp 1/4**–8	54	17
320030	320	29.5	4.1	120	4,627	35/9.2	144	4.0	Rp 1/4**–8	54	17
313035	313	35.4	4.1	144	4,526	42/11.1	173	4.0	Rp 1/4**–8	54	17
192033	192	32.9	7.6	72	2,776	39/10.3	86	4.0	Rp 3/8**–10	55	23
192044	192	43.9	7.6	96	2,776	59/15.6	115	4.0	Rp 3/8**–10	55	23
192055	192	54.8	7.6	120	2,776	66/17.4	144	4.0	Rp 3/8**–10	55	23
168066	168	65.8	7.6	144	2,437	79/20.9	173	4.0	Rp 3/8**–10	55	23
113057	113	57.5	13.3	72	1,634	69/18.2	86	4.0	Rp 3/8**–10	56	30
113077	113	76.6	13.3	96	1,634	92/24.3	115	4.0	Rp 3/8**–10	56	30
113096	113	95.8	13.3	120	1,634	115/30.4	144	4.0	Rp 3/8**–10	56	30
096115	96	114.9	13.3	144	1,392	138/36.5	173	4.0	Rp 3/8**–10	56	30
063104	63	104.3	24.2	72	911	125/33.0	86	4.0	G 1 1/4–20	58	40
063139	63	139.0	24.2	96	911	167/44.1	115	4.0	G 1 1/4–20	58	40
063174	63	173.8	24.2	120	914	209/55.2	144	4.0	G 1 1/4–20	58	40
052208	52	208.5	24.2	144	754	250/66.0	173	4.0	G 1 1/4–20	58	40
040163	40	162.9	37.7	72	578	195/51.5	86	4.0	G 1 1/4–20	58	50
040217	40	217.2	37.7	96	578	261/68.9	115	4.0	G 1 1/4–20	58	50
040271	40	271.5	37.7	120	580	326/86.1	144	4.0	G 1 1/4–20	58	50
033326	33	325.8	37.7	144	479	391/103.3	173	4.0	G 1 1/4–20	58	50
028237	28	237.0	54.9	72	405	284/75.0	86	4.0	G 1 1/2–25	62	60
028316	28	315.9	54.9	96	405	379/100.1	115	4.0	G 1 1/2–25	62	60
027395	27	394.9	54.9	120	392	474/125.2	144	4.0	G 1 1/2–25	62	60
022474	22	473.9	54.9	144	319	569/150.3	173	4.0	G 1 1/2–25	62	60
020322	20	322.5	74.7	72	289	387/102.2	86	4.0	G 1 1/2–25	62	70
020430	20	430.0	74.7	96	289	516/136.3	115	4.0	G 1 1/2–25	62	70
020538	20	537.6	74.7	120	290	645/170.4	144	4.0	G 1 1/2–25	62	70
016645	16	645.1	74.7	144	232	774/204.5	173	4.0	G 1 1/2–25	62	70
014475	14	475.1	110.0	72	202	571/150.8	86	4.0	G 2 1/4–40	68	85
014634	14	634.1	110.0	96	202	761/201.0	115	4.0	G 2 1/4–40	68	85
013793	13	792.6	110.0	120	189	951/251.2	144	4.0	G 2 1/4–40	68	85
011951	11	951.1	110.0	144	160	1,141/301.4	173	4.0	G 2 1/4–40	68	85

The permissible admission pressure on the suction side is approx. 50 % of max. permissible back pressure.

** The suction and discharge connectors Rp 1/4 and Rp 3/8 are inner threaded and fitted with double ball valves.

Materials In Contact With Chemicals

Pump Type	Hydraulic Ø mm	Liquid end	Suction/Discharge Connector	Ball Seats/ Seals	Valve Balls	Plungers
	…12 S to 30 S	Stainless steel no. 1.4571/ 1.4404	no. 1.4571/ 1.4404	SS/PTFE	Oxide Ceramic	Stainless steel/Ceramic
	…40 S to 70 S	Stainless steel no. 1.4571/ 1.4404	no. 1.4581	PTFE/PTFE	Stainless steel no. 1.4401	Stainless steel/Ceramic
	…85 S	Stainless steel no. 1.4571/ 1.4404	no. 1.4581	PTFE/PTFE	1.4404 (shim) Hast. C (spring)	Stainless steel/Ceramic

3.11 Makro TZ Plunger Metering Pumps

3.11.2 Identcode Ordering System

Motor-Driven Metering Pump TZKa Makro TZ 20

TZKa	Drive type											
	H	Main drive										
	A	Add-on										
	D	Double main drive										
	B	Double add-on										
		Type*										
		320009	320030	113057	063174	028237	020538					
		320012	313035	113077	052208	028316	016645					
		320014	192033	113096	040163	027395	014475					
		320017	192044	096115	040217	022474	014634					
		320018	192055	063104	040271	020322	013793					
		320024	168066	063139	033326	020430	011951					
			Material: Liquid end									
			SS	Stainless steel								
				Seals/diaphragm material								
				T	PTFE							
					Displacement body							
					S	Stainless steel plunger, chromoxide coated						
						Liquid end version						
						0	No valve springs					
						1	With valve springs					
							Hydraulic connection					
							0	Standard connection				
							4	SS union nut and insert				
								Version				
								0	With ProMinent® logo, no frame			
								2	Without ProMinent® logo, no frame			
								A	With ProMinent® logo, with frame, simplex			
								B	With ProMinent® logo, with frame, duplex			
								C	With ProMinent® logo, with frame, triplex			
								M	Modified			
									Electrical power supply			
									S	3 ph. 230/400 V 50/60 Hz (WBS)		
									P	3 ph. 230/400 V 60 Hz (Exe, Exd)		
									L	3 ph. 230/400 V 50 Hz (Exe, Exd)		
									R	Variable speed motor 4 pole 230/400 V		
									V (0)	Variable speed motor with integr. frequency converter		
									V (2)	With integrated frequency converter (Exd)		
									Z	1 ph, variable speed control set 1 ph, 230 V, 50/60 Hz		
									4	No motor, with 56 C flange		
									7	No motor, with 120/80 flange		
									8	No motor, with 160/90 flange		
									0	Without motor, externally mounted drive		
										Enclosure rating		
										0	IP 55 (Standard) ISO class F	
										1	Exe version ATEX-T3	
										2	Exde version ATEX-T4	
										A	ATEX power end	
											Stroke sensor	
											0	No stroke sensor
											1	With stroke sensor (Namur)
												Stroke length adjustment
												0 Stroke length adjustment, man.
												1 230 V stroke adjustment motor
												2 115 V stroke adjustment motor
												3 230 V 0-20 mA stroke controller
												4 230 V 4-20 mA stroke controller
												5 115 V 0-20 mA stroke controller
												6 115 V 4-20 mA stroke controller
												Application
												0 Standard

* digits 1-3 = back pressure [bar], digits 4-6 = feed rate [l/h]

3.11 Makro TZ Plunger Metering Pumps

Motor Data

Identcode characteristic		Power supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	1.5 kW	
		250-280 V/440-480 V	60 Hz	1.5 kW	
L1	3 ph, II2GEExeIIT3	220-240 V/380-420 V	50 Hz	1.5 kW	
L2	3 ph, II2GEExdIICT4	220-240 V/380-420 V	50 Hz	1.5 kW	with PTC thermistor, speed adjustment range 1:5
P1	3 ph, II2GEExeIIT3	250-280 V/440-480 V	60 Hz	1.5 kW	
P2	3 ph, II2GEExdIICT4	250-280 V/440-480 V	60 Hz	1.5 kW	with PTC thermistor, speed adjustment range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	2.2 kW	with PTC thermistor, speed adjustment range 1:20 with external fan 1 ph 230 V; 50/60 Hz
V0	3 ph, IP 55	400 V ±10 %	50/60 Hz	2.2 kW	variable-speed motor with integrated frequency converter
V2	3 ph, II2GEExdIICT4	400 V ±10 %	50/60 Hz	2.2 kW	Ex variable-speed motor with integrated frequency converter

3.11.3 Spare Parts Kits

Spare parts kit, plunger metering pump

comprising:

valve balls
valve plate with spring
ball seat discs
PTFE/graphite plunger packing rings
plunger guides
flat seals/O rings

Spare parts kit Makro TZ

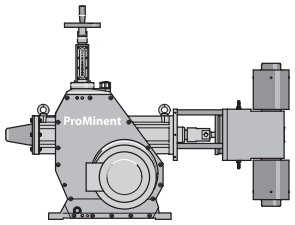
	Order no.
Spare parts kit Makro TZ FK 12/20 S DN 8	1019106
Spare parts kit Makro TZ FK 17/20 S DN 8	1019107
Spare parts kit Makro TZ FK 23/20 S DN 10	1019108
Spare parts kit Makro TZ FK 30/20 S DN 10	1019109
Spare parts kit Makro TZ FK 40/20 S DN 20	1019110
Spare parts kit Makro TZ FK 50/20 S DN 20	1019111
Spare parts kit Makro TZ FK 60/20 S DN 25	1019112
Spare parts kit Makro TZ FK 70/20 S DN 25	1019113
Spare parts kit Makro TZ FK 85/20 S DN 40	1019124

Notice for use in Ex-zone:

After 01.07.2003, only pumps with the corresponding EC-Ex-RL 94/9 code can be used in explosion-threatened operating areas. The explosion group, category and enclosure rating indicated in the identification shall comply with or exceed the conditions in the intended place of use.

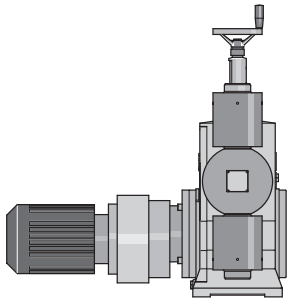
3.12 Makro/ 5 Plunger Metering Pumps

3.12.1 Makro/ 5 Plunger Metering Pumps



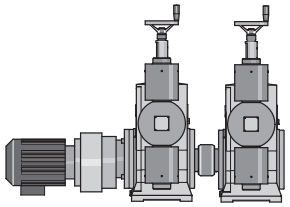
pk_2_075

The Makro/ 5 plunger metering pump is optionally driven by a 3 kW motor, 230/400 V, 50/60 Hz, enclosure rating IP 55, insulation class F. The stroke length is adjustable between 0…50 mm. The gearbox is housed in a sea water-resistant acrylic resin lacquered cast housing. The plunger liquid end is made of stainless steel 1.4571 and plungers are made of oxide ceramic or stainless steel with a ceramic wear-resistant coating. Metering reproducibility under defined conditions and when installed correctly, is better than ±0.5 % in a stroke length range of between 10 and 100 % (instructions in the operating instructions manual must be followed). The priming lift varies with the density and viscosity of the chemical, the connection pipework and the stroking rate of the pump. For all motor-driven metering pumps, for safety reasons, suitable overload protection must be provided during installation. A tensioning key is supplied as standard for re-tensioning packing rings.


pk_2_076

Makro/ 5 M5KaA Add-On Pumps

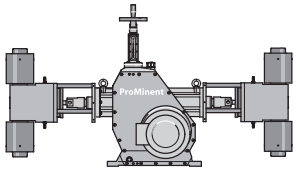
The Makro/ 5 AK add-on plunger metering pump can be used with the Makro/ 5 HK plunger main power end to expand to a duplex or triplex system. (At reduced backpressures up to four add-on power ends can be combined with a single main power end). The customer can retrofit the add-on power ends on site. If required, the main power end can be fitted with a 3 kW or a 5.5 kW motor. You will require a base frame when connecting add on power ends.


pk_2_077

Makro/ 5 Double Head Version M5KaD (Main Pump) /M5HaB (Add-On Pump)

For the Makro/ 5 HKD and AKD the same basic instructions as for the simplex pumps apply. It is also fitted, however, with a second liquid end.

The liquid ends operate in push-pull mode.



pk_2_078

Makro/ 5 Pump Control

Makro/ 5 stroke length actuator

Servomotor for automatic stroke length adjustment, adjusting time approx. 100 sec. for 100 % stroke length, fitted with 2 limit switches for min./max.-settings. Feedback potentiometer 1 k Ohm; enclosure rating: IP 54. Power supply 230 V (±10 %), 50/60 Hz, approx. 40 W, mechanical stroke rating display on Makro/ 5 power end.

Custom voltage ratings/higher enclosure ratings/Ex-proof available on request.

Includes:

Standard signal input 0/4-20 mA, (corresponds to stroke length 0-100 %); internal switch for manual/automatic operation, key switch for stroke length adjustment in manual operating mode, actual value output 0/4-20 mA for remote display.

Frequency control for speed controller in metal housing, enclosure rating IP 54

Frequency control encased in safety housing, IP 54, with integrated controller and main switch for the stated motor output.

Optional external control via 0/4-20 mA and/or 0-10 V corresponds to 0-50 (60) Hz output frequency.

Integrated controller with versatile functions including switching between external/internal control. In the case of internal control, frequency input via arrow keys, multi-lingual fault message display etc.

With evaluation equipment for motor temperature monitoring (thermistor protection).

Stroke sensor with namur signal

Mounted onto the crank drive of the Makro/ 5 gearbox. For precise detection of each metering stroke, comprising trip cam and inductive proximity switch, Namur-type switch signal. Suitable for batch metering in conjunction with electronic timers and/or for proportional metering in conjunction with proportional controller.

Retrofitting on factory premises only.

Permitted for ex-proof operation with enclosure rating EEx ia II C T6.

3.12 Makro/ 5 Plunger Metering Pumps

Technical data

Typ M5kaH	With motor 1500 rpm at 50 Hz				With motor 1800 rpm at 60 Hz				Suction head	Connection, intake/ pressure side	Shipping weight	Hydraulic piston Ø
	Delivery rate at max. backpressure			Max. stroke rate	Delivery rate at max. backpressure			Max. stroke rate				
	bar	l/h	ml/ stroke	Strokes/ min	psi	l/h	gph	Strokes/ min	mWC	G–DN	kg	mm
3200038	320	38	11	60	4,640	44	12	71	3.0	Rp 1/4–8	300	17
3200048	320	48	11	75	4,640	56	15	89	3.0	Rp 1/4–8	300	17
3200066	320	66	11	103	4,640	78	21	123	3.0	Rp 1/4–8	300	17
3200085	320	85	11	133	4,640	101	27	159	3.0	Rp 3/4–10	300	17
3200100	320	100	11	156					3.0	Rp 3/4–10	300	17
2400070	240	70	21	60	3,480	82	22	71	3.0	Rp 3/4–10	300	23
2400088	240	88	21	75	3,480	104	27	89	3.0	Rp 3/4–10	300	23
2400121	240	121	21	103	3,480	144	38	123	3.0	G 1–15	300	23
2160157	216	157	21	133	3,132	187	49	159	3.0	G 1–15	300	23
1700184	170	184	21	156					3.0	G 1–15	300	23
1400120	140	120	35	60	2,030	142	38	71	3.0	G 1–15	302	30
1400151	140	151	35	75	2,030	179	47	89	3.0	G 1–15	302	30
1400207	140	207	35	103	2,030	247	65	123	3.0	G 1–15	302	30
1400267	127	267	35	133	1,842	319	84	159	3.0	G 1 1/4–20	302	30
1000314	100	314	35	156					3.0	G 1 1/4–20	302	30
0800214	80	214	63	60	1,160	253	67	71	3.0	G 1 1/4–20	303	40
0800268	80	268	63	75	1,160	318	84	89	3.0	G 1 1/4–20	303	40
0800368	80	368	63	103	1,160	439	116	123	3.0	G 1 1/4–20	303	40
0700476	70	476	63	133	1,015	569	150	159	3.0	G 1 1/2–25	303	40
0560558	56	558	63	156					3.0	G 1 1/2–25	303	40
0500335	50	335	98	60	725	396	105	71	3.0	G 1 1/2–25	303	50
0500419	50	419	98	75	725	497	131	89	3.0	G 1 1/2–25	303	50
0500576	50	576	98	103	725	687	181	123	3.0	G 1 1/2–25	303	50
0450744	45	744	98	133	653	889	235	159	3.0	G 2–32	303	50
0350872	35	872	98	156					3.0	G 2–32	303	50
0350483	35	483	141	60	508	571	151	71	3.0	G 1 1/2–25	311	60
0350604	35	604	141	75	508	716	189	89	3.0	G 1 1/2–25	311	60
0350829	35	829	141	103	508	989	261	123	3.0	G 2–32	311	60
0301071	30	1,071	141	133	435	1,280	338	159	3.0	G 2–32	311	60
0251257	25	1,257	141	156					3.0	G 2–32	311	60
0250658	25	658	192	60	363	778	206	71	3.0	G 2–32	311	70
0250822	25	822	192	75	363	975	258	89	3.0	G 2–32	311	70
0251129	25	1,129	192	103	363	1,348	356	123	3.0	G 2–32	311	70
0231458	23	1,458	192	133	334	1,743	460	159	3.0	G 2 1/4–40	311	70
0181710	18	1,710	192	156					3.0	G 2 1/4–40	311	70
0160970	16	970	284	60	232	1,147	303	71	3.0	G 2 1/4–40	317	85
0161212	16	1,212	284	75	232	1,438	380	89	3.0	G 2 1/4–40	317	85
0161665	16	1,665	284	103	232	1,988	525	123	3.0	G 2 1/4–40	317	85
0162150	16	2,150	284	133	232	2,570	679	159	3.0	G 2 3/4–50	317	85
0162522	16	2,522	284	156					3.0	G 2 3/4–50	317	85
0121343	12	1,343	393	60	174	1,589	420	71	3.0	G 2 3/4–50	331	100
0121678	12	1,678	393	75	174	1,991	526	89	3.0	G 2 3/4–50	331	100
0122305	12	2,305	393	103	174	2,752	727	123	3.0	G 2 3/4–50	331	100
0122977	12	2,977	393	133	174	3,558	940	159	3.0	G 2 3/4–50	331	100
0103491	10	3,491	393	156					3.0	G 2 3/4–50	331	100
0062269	6	2,269	664	60	87	2,684	709	71	3.0	G 2 1/2–65	350	130
0062837	6	2,837	664	75	87	3,366	889	89	3.0	G 2 1/2–65	350	130
0063896	6	3,896	664	103	87	4,652	1,229	123	3.0	G 2 1/2–65	350	130
0065031	6	5,031	664	133	87	6,014	1,589	159	3.0	G 2 1/2–65	350	130
0066000	6	6,000	664	156					3.0	G 2 1/2–65	350	130

3.12 Makro/ 5 Plunger Metering Pumps

3.12.2 Identcode Ordering System

Makro/ 5 motor-driven metering pump

M5Ka	Drive type														
	H	Main drive													
	A	Add-on power end													
	D	Double main drive													
	B	Double add-on power end													
		Type*													
		3200038	1400120	0500335	0250658	0121343									
		3200048	1400151	0500419	0250822	0121678									
		3200066	1400207	0500576	0251129	0122305									
		3200085	1400267	0450744	0231458	0122977									
		3200100	1000314	0350872	0181710	0103491									
		2400070	0800214	0350483	0160970	0062269									
		2400088	0800268	0350604	0161212	0062837									
		2400121	0800368	0350829	0161665	0063896									
		2160157	0700476	0301071	0162150	0065031									
		1700184	0560558	0251257	0162522	0066000									
			Material Liquid end												
			SS	Stainless steel											
				Seals/diaphragm material											
				T	PTFE										
					Displacement body										
					S	Stainless steel plunger, chromoxide coated									
						Liquid end version									
						0	No valve springs								
						1	With valve springs								
							Hydraulic connection								
							0	Standard connection							
							4	SS union nut and insert							
								Version							
								0	With ProMinent® logo, no frame						
								2	No ProMinent® logo, no frame						
								A	With ProMinent® logo, with frame, simplex						
								B	With ProMinent® logo, with frame, duplex						
								C	With ProMinent® logo, with frame, triplex						
								D	With ProMinent® logo, with frame, quadruplex						
								M	Modified						
									Electrical power supply						
									S	3 ph. 230/400 V 50/60 Hz (WBS)					
									P	3 ph. 230/400 V 60 Hz (Exe, Exd)					
									L	3 ph. 230/400 V 50 Hz (Exe, Exd)					
									R	Variable speed motor 4 pole 230/400 V					
									V (0)	Motor with integrated frequency converter					
									V (2)	Motor with integrated frequency converter (Exd)					
									5	No motor, with IEC 100 gearbox					
									6	No motor, with IEC 112 gearbox					
									0	No motor, no gearbox					
										Enclosure rating					
										0	IP 55 (Standard) ISO class F				
										1	Exe version ATEX-T3				
										2	Exde version ATEX-T4				
										A	ATEX power end				
											Stroke sensor				
											0	No stroke sensor			
											1	With stroke sensor (Namur)			
												Stroke length adjustment			
												0	Stroke length adjustment, man.		
												3	230 V 0-20 mA stroke controller		
												4	230 V 4-20 mA stroke controller		
												5	115 V 0-20 mA stroke controller		
												6	115 V 4-20 mA stroke controller		
													Application		
													0	Standard	

* digits 1-3 = back pressure [bar], digits 4-7 = feed rate [l/h]

3.12 Makro/ 5 Plunger Metering Pumps

Materials In Contact With Chemicals

	Liquid End	Suction/Discharge Connector	Ball seat/ seals	Valve Balls	Plungers
Makro 5/50 HK …DN 8-DN 10	Stainless steel no. 1.4571/ 1.4404	1.4571/1.4404	SS/PTFE	Oxide ceramic	Stainless steel/Ceramic
Makro 5/50 HK …DN 15-DN 25	Stainless steel no. 1.4571/ 1.4404	1.4581	PTFE/PTFE	Stainless steel no. 1.4401	Stainless steel/Ceramic
Makro 5/50 HK …DN 32-DN 65	Stainless steel no. 1.4571/ 1.4404	1.4581/1.4404	PTFE/PTFE	Stainless steel no. 1.4404 (shim/ spring)	Stainless steel/Ceramic

The admissible priming pressure at the intake is approx. 50 % of the max. admissible back pressure.

Motor Data

Identcode characteristic		Power supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	3 kW	
		250-280 V/440-480 V	60 Hz	3 kW	
L1	3 ph, II2GEExeIIT3	220-240 V/380-420 V	50 Hz	3.6 kW	
L2	3 ph, II2GEExdIICT4	220-240 V/380-420 V	50 Hz	4 kW	with PTC thermistor, speed adjustment range 1:5
P1	3 ph, II2GEExeIIT3	250-280 V/440-480 V	60 Hz	3.6 kW	
P2	3 ph, II2GEExdIICT4	250-280 V/440-480 V	60 Hz	4 kW	with PTC thermistor, speed adjustment range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	3 kW	with PTC thermistor, speed adjustment range 1:5
V0	3 ph, IP 55	400 V ±10 %	50/60 Hz	3 kW	speed controlled motor with integrated frequency converter
V2	3 ph, II2GEExeICT4	400 V ±10 %	50/60 Hz	4 kW	Ex variable-speed motor with integrated frequency converter

Notice for use in Ex-zone:
After 01.07.2003, only pumps with the corresponding EC-Ex-RL 94/9 code can be used in explosion-threatened operating areas. The explosion group, category and enclosure rating indicated in the identification shall comply with or exceed the conditions in the intended place of use.

3.12.3 Spare Parts Kits

Spare parts kits plunger metering pumps

Comprising:

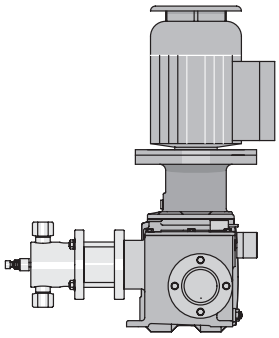
Valve balls
Valve plate with spring
Ball seat discs
PTFE/graphite plunger packing rings
Plunger rings
Flat seals/O-rings

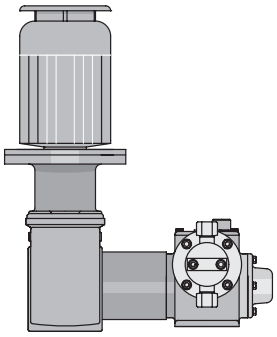
Spare parts kits Makro/ 5

	Order no.
Spare parts kit Makro/ 5 FK 17/50 S DN 8	1005899
Spare parts kit Makro/ 5 FK 17/50 S DN 10	1005536
Spare parts kit Makro/ 5 FK 23/50 S DN 10	1005004
Spare parts kit Makro/ 5 FK 23/50 S DN 15	1005900
Spare parts kit Makro/ 5 FK 30/50 S DN 15	1005901
Spare parts kit Makro/ 5 FK 30/50 S DN 20	1005537
Spare parts kit Makro/ 5 FK 40/50 S DN 20	1005902
Spare parts kit Makro/ 5 FK 40/50 S DN 25	1005538
Spare parts kit Makro/ 5 FK 50/50 S DN 25	1005539
Spare parts kit Makro/ 5 FK 60/50 S DN 25	1005903
Spare parts kit Makro/ 5 FK 60/50 S DN 32	1005540
Spare parts kit Makro/ 5 FK 70/50 S DN 32	1005541
Spare parts kit Makro/ 5 FK 70/50 S DN 40	1005904
Spare parts kit Makro/ 5 FK 85/50 S DN 40	1005542
Spare parts kit Makro/ 5 FK 85/50 S DN 50	1005905
Spare parts kit Makro/ 5 FK 100/50 S DN 50	1005543
Spare parts kit Makro/ 5 FK 130/50 S DN 65	1005544

3.13 ProMinent® ORLITA® PS Plunger Metering Pumps

3.13.1 ORLITA® PS Plunger Metering Pumps





pk_2_123

Plunger head with stuffing box packing. The plunger oscillates inside the cylinder, thereby displacing the feed medium.

The packing can be adjusted, even while the pump is operating, with the adjusting screw at the front.

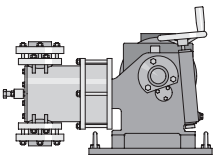
The lantern on the back of the head can be used as a collector for leaked fluid. This point can be used to drain off leaked fluid or to add sealing, flushing or lubricating agents.

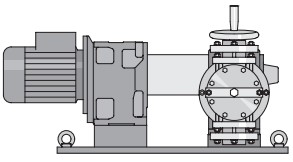
The cone-type suction and discharge valves ensure minimum wear, low pressure loss ($NPSH_R$) and self-cleaning.

All parts in contact with the feed chemical are made of stainless steel with PTFE seals.

Pump type	Plunger Ø	Displacement	Capacity (theo.) in l/h at strokes/min 50 Hz					Max. pressure
	mm	cm³/stroke	70	88	108	140	200	bar
PS 18/	5	0.29	1.2	1.6	1.9	2.5	3.5	250.0
	6	0.42	1.8	2.2	2.7	3.6	5.1	250.0
	7	0.58	2.4	3.0	3.7	4.8	6.9	250.0
	8	0.75	3.2	4.0	4.9	6.3	9.0	250.0
	10	1.18	4.9	6.2	7.6	9.9	14.1	200.0
	12	1.70	7.1	9.0	11.0	14.3	20.4	139.0
	16	3.02	12.7	15.9	19.5	25.3	36.2	78.0
	20	4.71	19.8	24.9	30.5	39.6	56.5	50.0
	25	7.36	30.9	38.9	47.7	61.9	88.4	32.0
	30	10.60	44.5	56.0	68.7	89.1	127.2	22.0
	36	15.27	64.1	80.6	98.9	128.3	183.2	15.0
	40	18.85	79.2	99.5	122.1	158.3	226.2	12.0
	50	29.45	123.7	155.5	190.9	247.4	353.4	8.0
	65	49.77	209.1	262.8	322.5	418.1	597.3	5.0

Pump type	Plunger Ø	Displacement	Capacity (theo.) in l/h at strokes/min 50 Hz					Max. pressure
	mm	cm³/stroke	70	88	108	140	200	bar
PS 35/	8	1.01	4.2	5.3	6.5	8.4	12.1	250.0
	10	1.57	6.6	8.3	10.2	13.2	18.8	250.0
	12	2.26	9.5	11.9	14.7	19.0	27.1	250.0
	16	4.02	16.9	21.2	26.1	33.8	48.3	157.0
	20	6.28	26.4	33.2	40.7	52.8	75.4	100.0
	25	9.82	41.2	51.8	63.6	82.5	117.8	64.0
	30	14.14	59.4	74.6	91.6	118.8	169.6	44.0
	36	20.36	85.5	107.5	131.9	171.0	244.3	31.0
	40	25.13	105.6	132.7	162.9	211.1	301.6	25.0
	50	39.27	164.9	207.3	254.5	329.9	471.2	16.0
	65	66.37	278.7	350.4	430.1	557.5	796.4	9.0
	80	100.53	422.2	530.8	651.4	844.5	1,206.4	6.0
	100	157.08	659.7	829.4	1,017.9	1,319.5	1,885.0	4.0





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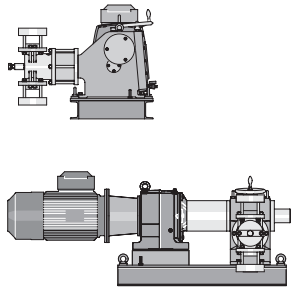
Pump type	Plunger Ø	Displacement	Capacity (theo.) in l/h at strokes/min 50 Hz						Max. pressure
	mm	cm³/stroke	70	90	115	134	152	194	bar
PS 80/	20	6.28	26.4	33.9	43.4	50.5	57.3	73.1	250.0
	25	9.82	41.2	53.0	67.7	78.9	89.5	114.3	250.0
	30	14.14	59.4	76.3	97.5	113.7	128.9	164.6	178.0
	36	20.36	85.5	109.9	140.5	163.7	185.7	237.0	123.0
	40	25.13	105.6	135.7	173.4	202.1	229.2	292.5	100.0
	50	39.27	164.9	212.1	271.0	315.7	358.1	457.1	64.0
	60	56.55	237.5	305.4	390.2	454.7	515.7	658.2	40.0
	65	66.37	278.7	358.4	457.9	533.6	605.3	772.5	38.0
	80	100.53	422.2	542.9	693.7	808.3	916.8	1,170.2	25.0
	100	157.08	659.7	848.2	1,083.8	1,262.9	1,432.6	1,828.4	16.0
	125	245.44	1,030.8	1,325.4	1,693.5	1,973.3	2,238.4	2,856.9	10.0

3.13 ProMinent® ORLITA® PS Plunger Metering Pumps

Pump type	Plunger Ø	Displacement	Capacity (theo.) in l/h at strokes/min 50 Hz						Max. pressure
	mm	cm³/stroke	70	90	115	134	152	194	bar
	140	307.88	1,293.1	1,662.5	2,124.3	2,475.3	2,807.8	3,583.7	8.0
	160	402.12	1,688.9	2,171.5	2,774.7	3,233.1	3,667.4	4,680.7	6.0

Pump type	Plunger Ø	Displacement	Capacity (theo.) in l/h at strokes/min 50 Hz						Max. pressure
	mm	cm³/stroke	67	88	103	137	154	173	bar
PS 180/	30	28.27	113.7	149.3	174.7	232.4	261.3	293.5	229.0
	36	40.72	163.7	215.0	251.6	334.7	376.2	422.6	159.0
	40	50.27	202.1	265.4	310.6	413.2	464.5	521.8	129.0
	50	78.54	315.7	414.7	485.4	645.6	725.7	815.2	82.0
	54	91.61	368.3	483.7	566.1	753.0	846.5	950.9	70.0
	65	132.73	533.6	700.8	820.3	1,091.1	1,226.4	1,377.8	48.0
	70	153.94	618.8	812.8	951.3	1,265.4	1,422.4	1,597.9	42.0
	80	201.06	808.3	1,061.6	1,242.6	1,652.7	1,857.8	2,087.0	32.0
	94	277.59	1,115.9	1,465.7	1,715.5	2,281.8	2,564.9	2,881.4	23.0
	125	490.87	1,973.3	2,591.8	3,033.6	4,035.0	4,535.7	5,095.3	13.0
	140	615.75	2,475.3	3,251.2	3,805.3	5,061.5	5,689.5	6,391.5	10.0
	160	804.25	3,233.1	4,246.4	4,970.3	6,610.9	7,431.2	8,348.1	8.0
	200	1,256.64	5,051.7	6,635.0	7,766.0	10,329.6	11,611.3	13,043.9	5.0



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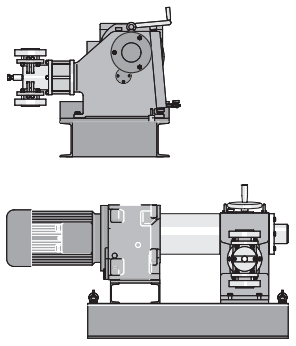
Pump type	Plunger Ø	Displacement	Capacity (theo.) in l/h at strokes/min 50 Hz						Max. pressure
	mm	cm³/stroke	69	91	113	134	155	182	bar
PS 600/	30	28.27	116.6	153.6	191.4	226.8	262.4	309.3	400.0
	36	40.27	167.9	221.2	275.6	326.7	377.9	445.3	353.0
	40	50.27	207.3	273.1	340.2	403.3	466.6	549.8	286.0
	50	78.54	323.9	426.7	531.6	630.1	729.0	859.0	183.0
	54	91.61	377.8	497.7	620.1	735.0	850.3	1,002.0	157.0
	65	132.73	547.3	721.2	898.4	1,064.9	1,232.0	1,451.8	108.0
	70	153.94	634.8	836.4	1,042.0	1,235.0	1,428.8	1,683.7	93.0
	80	201.06	829.1	1,092.4	1,360.9	1,613.1	1,866.2	2,199.1	71.0
	94	277.59	1,144.7	1,508.3	1,878.9	2,227.1	2,576.5	3,036.2	51.0
	125	490.87	2,024.2	2,667.1	3,322.6	3,938.2	4,556.2	5,368.9	29.0
	140	615.75	2,539.2	3,345.6	4,167.9	4,940.1	5,715.3	6,734.8	23.0
	160	804.25	3,316.5	4,369.8	5,443.7	6,452.4	7,464.8	8,796.5	18.0
	200	1,256.64	5,182.0	6,827.8	8,505.8	10,081.9	11,663.8	13,744.5	11.0



pk_2_125

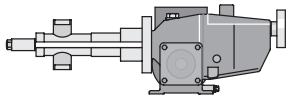
Pump type	Plunger Ø	Displacement	Capacity (theo.) in l/h at strokes/min 50 Hz						Max. pressure
	mm	cm³/stroke	83	98	112	129	148	171	bar
PS 1400/	40	75.40	375.6	442.0	505.9	584.3	669.5	773.3	400.0
	50	117.81	587.0	690.6	790.4	912.9	1,046.1	1,208.3	275.0
	60	169.65	845.2	994.4	1,138.2	1,314.6	1,506.4	1,740.0	191.0
	70	230.91	1,150.4	1,353.5	1,549.2	1,789.3	2,050.3	2,368.3	140.0
	80	301.59	1,502.6	1,967.9	2,023.5	2,337.1	2,678.0	3,093.3	107.0
	94	416.39	2,074.5	2,440.8	2,793.6	3,226.6	3,697.3	4,270.6	77.0
	125	736.31	3,668.5	4,316.1	4,940.1	5,705.7	6,538.1	7,551.9	44.0
	140	923.63	4,601.7	5,414.2	6,196.9	7,157.3	8,201.4	9,473.1	35.0
	160	1,206.37	6,010.4	7,071.5	8,093.9	9,348.3	10,712.0	12,373.0	25.0
	200	1,884.96	9,391.2	11,049.3	12,646.7	14,606.7	16,737.4	19,332.9	17.0
	280	3,694.51	18,406.8	21,656.6	24,787.5	28,629.1	32,805.4	37,892.4	8.0

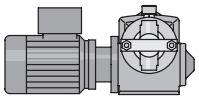
Note: All specified performance data is at motor frequency 50 Hz.

Other variants on request

3.14 ProMinent® ORLITA® DR Plunger Metering Pumps

3.14.1 ORLITA® DR Valve-Free Plunger Metering Pump





pk_2_081_1

Valve-free metering plunger head. The valve-free plunger liquid end functions by means of the oscillating and rotating plunger action. The suction and discharge sides are opened and closed by the plunger itself. The pump therefore needs no valves and can be operated over a wide stroke rate range.

This principle enables precise metering of highly viscous liquids which may contain even large solids.

The pump head is made of stainless steel. Plungers and cylinders are given a wear-resistant surface finish.

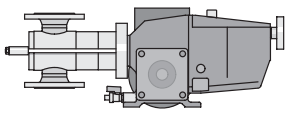
Depending on the application the pump head is also available in other high performance materials.

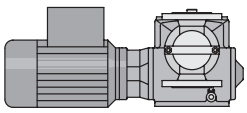
The clearance between the plunger and the cylinder, which is responsible for the seal, depends on the viscosity of the liquid.

The lantern on the rear head end can be used as a collector for leaked fluid or can be used to add flushing, lubrication or sealing agent. The lantern is sealed with elastomer sealing lips. The feed direction depends on the installation position of the plunger.

The backlash effect can be adjusted by turning the head around its longitudinal axis.

Pump type	Plunger Ø	Displacement	Capacity (theo.) in l/h at strokes/min 50 Hz			Max. pressure
	mm	cm³/stroke	56	75	112	bar
DR 15/	5	0.29	1.0	1.3	2.0	100.0
	7	0.58	1.9	2.6	3.9	400.0
	12	1.70	5.7	7.6	11.4	159.0
	18	3.82	12.8	17.2	25.7	70.0
	25	7.36	24.7	33.1	49.5	36.0
	36	15.27	51.3	68.7	103.0	17.0
	50	29.45	99.0	133.0	198.0	9.0
	70	57.73	194.0	260.0	388.0	4.0





pk_2_119

Pump type	Plunger Ø	Displacement	Capacity (theo.) in l/h at strokes/min 50 Hz				Max. pressure
	mm	cm³/stroke	56	75	112	140	bar
DR 150/	12	3.62	12.2	16.3	24.3	30.4	400.0
	18	8.14	27.4	36.6	54.7	68.4	400.0
	25	15.71	52.8	71.0	105.6	132.0	250.0
	36	32.57	109.4	146.6	218.9	273.6	147.0
	50	62.83	211.1	282.7	422.2	527.8	76.0
	70	123.15	413.8	554.2	827.6	1,034.5	38.0
	90	203.58	684.0	916.1	1,368.0	1,710.0	23.0
	120	361.91	1,216.0	1,628.6	2,432.1	3,040.1	13.0
	140	492.60	1,655.1	2,216.7	3,310.3	4,137.9	9.0

Note: All performance specifications referred to 50 Hz motor frequency.

Other versions available on request.